THE EFFECTS OF PARENTAL, COMMUNITY, PEER RISK AND PROTECTIVE FACTORS ON HISPANIC ADOLESCENT DRUG USE ACROSS ADOLESCENCE

by

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STATEMENT OF DISSERTATION APPROVAL

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ABSTRACT

The current study investigated the relationships between Hispanic adolescent drug use, friends' drug use, parental and community risk and protective factors across Hispanic adolescent development. Survey data from the 2012 Arizona Youth Survey (AYS) were analyzed to better understand the relationship between the aforementioned variables. A total of 14,273 surveys completed by 8th-, 10th-, and 12th-grade Hispanic adolescents were used in the analyses. Generalized Linear Mixed Model (GLMM) regression analyses were used to assess the relationships between the research variables. Results confirmed the significant relationship between higher levels of friends' substance use and Hispanic adolescent substance use. Analyses also indicated that factors such as gender, predominant language spoken at home, grade level, parental attachment, parental injunctive norms, and community injunctive norms were significant factors associated with Hispanic adolescent use of alcohol, marijuana, and cigarettes (AMC). Parental attachment and parental injunctive norms were also associated with a reduction in the strength of the relationship between Hispanic adolescent AMC use and friends' use. Results from prescription drug abuse (PD abuse) models indicate that many factors were not significant or were associated with less change in use. Some variability in the variable results were noted across grade levels. Future research that includes additional comparison groups, multiple measures, and single drugs as outcomes may provide greater understanding of factors associated with Hispanic adolescent substance use.

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CHAPTER I

INTRODUCTION

Substance use[1] is one of the largest causes of morbidity and death among youth within the United States (Johnston, O'Malley, Bachman, & Schulenberg, 2009b). In addition to serious problems that often occur during adolescence, substance use can also lead to delinquency and other difficulties that persist well into adulthood (Kim, Kwak, & Yun, 2010). The total estimated economic cost of youth and adult substance use was estimated at $193 billion in 2007 (National Drug Intelligence Center, 2011). Some of the economic costs included areas such as incarceration, drug abuse-related illness, crime victimization, treatment, premature death, social welfare, and lost productivity. While placing an estimated economic cost on the effects of substance abuse may require some less than exact calculations, it does help to illustrate that substance abuse has broad negative effects that go well beyond individual and family domains. Understanding the factors that contribute to adolescent substance use informs prevention and treatment

[1] For the purpose of this current study, the terms "substance use" and "drug use" are used interchangeably and denote any use of controlled substances and other substances that are illegal for adolescents to consume. Some might argue that the term "abuse" is a more accurate or appropriate term that distinguishes between experimental use of substances and higher levels of use; however, the nature of the variables that will be examined in this study will likely be better understood by considering all levels of use by adolescents across adolescent development.

development and improvement efforts, provides insight into other comorbid behavioral difficulties that often occur during adolescence, and can help mitigate negative outcomes at both individual and societal levels.

Understanding current rates and trends in adolescent drug use provides researchers with a scope of the problem and can inform prevention and treatment efforts. The Monitoring the Future (MTF) study is an annual substance use survey of American secondary students, college students, and young adults that has been conducted by Johnston, O'Malley, Bachman, and Shulenberg at the Institute for Social Research at the University of Michigan since 1975 (Johnston et al., 2009b). MTF is a well-respected resource that provides valuable information regarding national rates and trends in substance use. Information from these surveys has been used to help inform a wide range of substance use research (Cleveland, Feinberg, Bontempo, & Greenberg, 2008; Galaif, Newcomb, Vega, & Krell, 2007; Hawkins, Catalano, & Arthur, 2002; Olds & Thombs, 2001; Windle, 2000). Results from the 2013 MTF surveys indicate that 9.9%, 20.1%, and 26.6% of 8th-, 10th-, and 12th-grade adolescents, respectively, have used illicit drugs (including inhalants) within a month of completing the MTF survey (Johnston, O'Malley, Miech, Bachman, & Schulenberg, 2014). Additionally, lifetime illicit drug use (including inhalants) of 8th-, 10th-, and 12th-graders was 25.7%, 41.3%, and 52.0%, respectively. Past 30-day use of any prescription drug by 12th graders (the only grade that had this data) was reported by 7% of respondents, whereas lifetime use was reported by 21.5% of respondents. While overall adolescent substance use rates have been declining since the mid-1990s, recent results from the MTF surveys indicate that declines that had been seen within the last decade have continued for some drugs, but have also reversed for

marijuana use rates (Johnston et al., 2014). Despite trends that indicate relatively stable use rates across a majority of drug categories, rates of adolescent substance use continue to occur at alarming levels.

Overall, there is a great deal of research examining factors associated with adolescent substance use; however, there has been a relative lack of research examining these factors within minority populations (Bersamin, Paschall, & Flewelling, 2005; Botvin, Griffin, Diaz, & Ifill-Williams, 2001; Chen, Balan, & Price, 2012; Griffin, Scheier, Botvin, & Diaz, 2000; Wallace & Muroff, 2002). Research that has utilized samples with large minority populations have found significant differences between risk and protective factors associated with drug use across racially and ethnically diverse populations (Bersamin et al., 2005; Choi, He, Herrenkohl, Catalano, & Toumbourou 2012; Chen et al., 2012; Griffin et al., 2000; Wallace & Muroff, 2002). Recent census data indicate that the Hispanic population is the largest and one of the youngest and fasting growing minority groups within the United States (Humes, Jones, & Ramirez, 2011). According to data from the 2010 census, there were approximately 50.5 million individuals who identified themselves as Hispanic or Latino in the United States in 2010, which was 16% of the total population at that time (Humes et al., 2011). The Hispanic population grew by 43% between 2000 and 2010, increasing from 13% to 16% of the total U.S. population (Jones et al., 2011). This increase was significantly greater than the rate of increase in the non-Hispanic population, which was 5% during the same time period. Growth in the Hispanic population accounted for over half of the total population growth within the United States from 2000 to 2011, and historical as well as current population trends indicate that the Hispanic population within the United States will

continue to increase at a faster rate than other segments of the U.S. population (Jones et al., 2011). As the Hispanic population continues to grow, there is a need to improve substance use prevention and intervention to serve this group (Griffin et al., 2000; Kam & Cleveland, 2011; Parsai, Voisine, Marsiglia, Kulis, & Nieri, 2008).

While the rates of use by Hispanic adolescents is comparable to those of non-Hispanic adolescents (Johnston et al., 2014), factors that are often unique to Hispanic adolescent development such as acculturation, immigration, and a family-centered orientation have been found to be significant contributors to Hispanic adolescent substance use (Santisteban et al., 2003). Due to unique cultural and environmental factors, increasing demographic importance, and a lack of research that utilizes Hispanic adolescent samples, this research study utilized data from Hispanic adolescents to expand upon the current knowledge base associated with Hispanic adolescent substance use across adolescent development. As our understanding of Hispanic adolescent substance use improves, we would expect that substance use prevention and intervention programs would be better equipped to address the specific needs of Hispanic adolescents and their families.

Review of the Literature

Early initiation of substance use by adolescents is one factor that is often associated with increased risk of more extensive and persistent future drug problems (Hawkins et al., 2002). According to the 2013 MTF survey, approximately 14.8% of 8th-grade students reported that they have tried cigarettes, 27.8% reported that they have consumed more than a few sips of alcohol by eighth grade, with 12.2% reporting that they had been drunk at least once in their lifetime, while 16.5% reported that they had

used marijuana or hashish before (Johnston et al., 2014). Of the 12th-grade 2014 MTF respondents, 38.1% reported that they have tried cigarettes, 68.2% reported that they have consumed more than a few sips of alcohol by 12th-grade, 52.3% reported that they had been drunk at least once in their lifetime, and 45.5% reported that they had used marijuana or hashish before (Johnston et al., 2014). Not surprisingly, frequency of adolescent substance use increases with age in the areas of lifetime use as well as prior 30-day use.

Adolescence substance use rates for many drugs had been declining since the mid-1990s; however, as noted earlier, some drugs such as marijuana have been increasing in the past few years. Johnston, O'Malley, Bachman, and Schulenberg (2009a) note that a lack of sustained prevention efforts could lead to future increases, just as it may have contributed to a significant rise in adolescent substance use that occurred in the early 1990s. Notwithstanding the gains that have been made since the mid-1990s, overall adolescent substance use in the U.S. continues to occur at problematic levels (Johnston et al., 2009b; Office of National Drug Control Policy, 2004). In addition, Johnston, O'Malley, Bachman, and Schulenberg (2009c) note that recent decreases in perceived risk associated with marijuana, ecstasy, LSD, and inhalant use could be precursors to increased interest and possible use of these drugs. Johnston et al. (2009b) succinctly summarize the need for continued emphasis on the problem of drug abuse when they note that it is "a recurring and relapsing problem that must be contained to the greatest extent possible on an ongoing basis" (2009b, p. 39). Based upon the recognition that adolescent drug use requires continued containment, a review of some of the research regarding substance abuse prevention is warranted.

Adolescent Substance Use Prevention: Risk and Protective Factors

Although treating adolescents with current substance use problems is an important component in addressing current rates of adolescent substance use, problems such as high costs and difficulties with providing treatment services to all those who are in need of them are often cited as limitations (Hawkins, Catalano, & Miller, 1992). Prevention is the other area that is often cited as an important component in mitigating adolescent substance use. Results from research studies have shown that for every dollar that is spent on research-based substance abuse prevention programs up to 10 dollars in future treatment costs can be saved (National Institute on Drug Abuse [NIDA], 2004). In order to better understand substance use prevention methodology, I will discuss briefly one of the major theoretical perspectives that has influenced current substance use prevention practices.

The Social Development Model

Although there are a number of theoretical perspectives that have contributed to current substance use prevention research and practices, the *social development model* (SDM) is the theoretical model that most clearly addresses the substance use prevention methods that will be examined by the current research study. Catalano, Kosterman, Hawkins, Newcomb, and Abbot (1996) provide the following definition of the social development model: "The social development model is a general theory of human behavior that seeks to explain antisocial behaviors through specification of predictive developmental relationships" (p. 429). Based upon theoretical concepts from control theory, social learning theory, and differential association theory (Catalano et al., 1996;

Cleveland, Collins, Lanza, Greenberg, & Feinberg, 2010), the social development model asserts that relationships between an individual and his or her social environment have a strong effect upon that individual's development and behavior.

As Cleveland et al. (2010) noted, the SDM posits that an individual's interactions with socializing forces such as peers, parents, schools, and other community institutions or contexts set the stage for learned patterns of behavior. Consequently, the model hypothesizes that an individual's behavior is greatly dependent upon the predominant belief systems, behaviors, and mores that are espoused by those with whom the individual is bonded (Catalano et al., 1996). Given that socializing agents play an important role in shaping adolescent behavior, one particularly important area is the social bonds between adolescents and socializing agents (Cleveland et al., 2010). Specifically, as an adolescent develops stronger social bonds or attachments to socializing agents such as parents or peers, she will experience greater pressure to adhere to group norms and eschew behaviors that are incompatable to those espoused by the group to whom she is attached. This suggests that an individual who is attached or bonded to a group of individuals that engages in antisocial behaviors is likely to internalize the norms of this group and engage in the same or similar antisocial behaviors; conversely, an individual who is attached or bonded to a group of individuals that engages in prosocial behaviors is likely to internalize the norms of this group and participate in the same or similar prosocial behaviors. The social development model was established and based upon research that has examined the relationships between risk and protective factors and the development of antisocial behaviors (Catalano et al., 1996). Understanding the relationships between risk and protective factors and adolescent drug

use has been the focus of many substance use prevention efforts and research studies (Arthur, Hawkins, Pollard, Catalano, & Baglioni, 2002; Cleveland et al., 2008; Hawkins et al., 1992; Hawkins et al., 2002; Henry, 2008; Galaif et al., 2007; Kaufman, Wyman, Forbes-Jones, & Barry, 2007; NIDA, 2004).

Risk and Protective Factors

Risk and protective factors are often measured and examined to assess relationships between unwanted behaviors, such as substance use, and factors that are likely to contribute to those behaviors. *Risk factors* are hazards, characteristics, or variables that, when present, increase the risk that an individual will develop a problem or disorder (Arthur et al., 2002). *Protective factors* are factors that directly or indirectly reduce the effects of risk factors, thus reducing the risk that an individual will develop a problem or disorder (Arthur et al., 2002). Risk and protective factors are often organized within four general categories or domains: community, school, family, and individual/peer (Arthur et al., 2002; Cleveland et al., 2008). Research has shown that exposure to increasing numbers of risk factors is a strong predictor of behavioral difficulties or disorders, leading to the conclusion that multiple factors should be considered when addressing prevention (Arthur et al., 2002; Cleveland et al., 2008; Coie et al., 1993; Hawkins et al., 1992). In addition to reducing risk factors, increasing or promoting protective factors is one form of prevention that may be effective in reducing the likelihood of unhealthy behaviors (Coie et al., 1993; Hawkins et al., 1992). Promoting protective factors may inhibit the initial appearance of risk factors and moderate or reduce the effects of risk factors (Coie et al., 1993). Prior to the explosion of research

conducted on risk and protective factors a great deal of research had been conducted on risk factors that were associated with negative behaviors and outcomes (Jessor, Van Den Bos, Vanderryn, Costa, & Turbin, 1995). Increased research interest in protective factors has been attributed to researchers' observations that many children exposed to significant risk factors do not always experience the associated negative consequences (Jessor et al., 1995). It is important to note that protective factors are not the absence of risk factors, nor are risk and protective factors simply the opposite ends of a spectrum (Jessor et al., 1995). Protective and risk factors are independent variables that are associated with specific effects on behaviors. Ultimately, a risk and protective factors approach to prevention seeks to decrease the effects of risk factors in an adolescent's life, while also increasing the number of protective factors (Hawkins et al., 1992).

Identifying and modifying protective factors is a method that has been recommended by multiple researchers (Arthur et al., 2002; Hawkins et al., 2002; NIDA, 2004). Research studies have confirmed the effectiveness of programs that target a variety of risk and protective factors such as students' beliefs about drug norms, social acceptability of drug use, personal and social competence skills, academic failure, and positive bonding to school and family (Botvin, Baker, Dusenbury, Botvin, & Diaz, 1995; Ellickson, McCaffrey, Ghosh-Dastidar, & Longshore, 2003; Griffin, Botvin, Nichols, & Doyle, 2003; Hawkins et al., 2002; O'Donnell, Hawkins, Catalano, Abbott, & Day, 1995).

As Hawkins et al. (1992) reported, it is often difficult or unfeasible to control many of the risk and protective factors that are associated with adolescent substance use; consequently, they recommend that more easily manipulated factors that mediate or

moderate the effects of risk factors be identified and utilized to improve the prevention of adolescent substance use. Although mediation and moderation are two research concepts that can easily be misunderstood (Frazier, Tix, & Barron, 2004), both have the potential to provide important information that can inform research, prevention, and intervention efforts. Frazier et al. (2004) define a *moderator* as "a variable that alters the direction or strength of the relation between a predictor and an outcome" (p. 116). As a hypothetical example, suppose that family history of alcoholism is highly correlated with adolescent drug use, and in addition, the strength of this relationship is influenced by adolescent gender. Thus, gender would moderate the relationship between family history of alcoholism and adolescent drug use. Frazier et al. define a *mediator* as "a variable that explains the relation between a predictor and an outcome" (p. 116). A hypothetical example might be: if a family history of alcoholism leads to high levels of neglect, which in turn contributes to adolescent drug use, then the mediator in this example would be level of neglect. Analyzing moderator and mediator relationships between variables can contribute to better understanding of how and why some variables are associated with substance use, which in turn can improve efforts to address these relationships.

Targeting particularly significant factors at optimal developmental stages, adjusting methods to the needs of individual communities, and recognizing individual differences that may moderate the effectiveness of some factors can lead to improved outcomes and more efficient uses of resources in substance use prevention programming (Hawkins et al. 2002; 1992; NIDA, 2004). For example, in 2008, Cleveland et al. analyzed cross-sectional survey data from 91,778 students in grades 6, 8, 10, and 12. The analysis found that family and community factors were stronger predictors of recent or

lifetime substance use for younger adolescents than they were for older adolescents. They also found that peer and school factors were stronger predictors of recent and lifetime substance use for older adolescents than they were for younger adolescents. A study by Wills, McNamara, and Vaccaro (1995) found that adolescents from families with lower education levels were more vulnerable to substance use risk factors such as negative life events and friends' beer or wine use; however, they also found that this group also benefited more from protective factors such as emotional support, academic competence, and behavioral competence. These two studies illustrate that risk and protective factors often have moderators (i.e., developmental stage or family education levels) that influence the relationship with substance use. Better identification and understanding of moderating variables assist professionals with improving current and future prevention and treatment services. One area that lends itself to targeted prevention and intervention efforts is the developmental progression of substance use across adolescence. The next section will discuss research that has examined adolescent substance use across adolescent development.

Substance Use Across Adolescent Development

While it is often acknowledged that risk and protective factors are dynamic processes that are likely to vary in their effects on adolescent behavior across adolescent development, research has been lacking in this area (Cleveland, Feinberg, & Jones, 2012; Harris Abadi, Shamblen, Thomson, Collins, & Johnson, 2011; Tang & Orwin, 2009). Risk and protective factors likely interact differently across adolescent development due to rapid changes in cognitive abilities, physical maturation, and social dynamics within

family and peer groups (Tang & Orwin, 2009). Several studies that have examined the effects of risk and protective factors across adolescent development have found evidence that parental and peer influence on adolescent behavior shifts during this period, with parental influence diminishing and peer influence increasing (Cleveland et al., 2008; Ellickson, Tucker, Klein, & Saner, 2004; Tang & Orwin, 2009). Some studies, however, have reported conflicting results that have found that both parental and peer influences remain consistently strong across adolescent development (Cleveland et al., 2012; Ellickson et al., 2004; Ennett et al., 2006; Kelly et al., 2012). This section will analyze results from multiple studies that have examined adolescent substance abuse across adolescent development.

Steinberg and Monahan (2007) present two explanations of why later adolescence is a time when individuals experience greater susceptibility to peer influence. The first points to the increasingly important role that peer groups play in defining social norms. As older adolescents experience increased opportunities to associate with social groups, attachment to peers also increases, which likely leads to social pressure to conform to group interests, styles, and values. The second explanation, which is compatible and may work in conjunction with the first explanation, is that changes within an individual adolescent's susceptibility to peer pressure increase during adolescence as the individual develops greater autonomy from her parents, but is not yet developmentally ready to be fully autonomous, which increases her reliance on peers (Steinberg & Monahan, 2007). Both of these explanations indicate that older adolescents are more likely to experience increased pressures from peers to initiate or increase negative behaviors such as substance abuse.

Cleveland et al. (2008) found that drug use by younger adolescents had a stronger correlation with family and community factors than older adolescent drug use, while peer and school factors were more salient for older adolescents than for younger adolescents (Cleveland et al., 2008). The strength of the association between younger adolescent drug use and community factors was of particular interest given that this finding is somewhat inconsistent with the assumption that older adolescents are more likely to spend a greater amount of unsupervised time outside of the family context. These results indicate that risk and protective factors can often vary in unsuspected ways across environmental domains. Better understanding of these differential effects on adolescent development and across ecological domains will likely lead to improvements in intervention and prevention efforts. One recommendation given by Cleveland et al. (2008) was for additional research to be conducted to explore the effects of community factors on adolescent drug use across adolescent development.

Cleveland et al. (2012) conducted a longitudinal study that examined risk and protective factors associated with adolescent alcohol use within individual, family, peer, community, and school domains. The study utilized data that was collected from control group participants in a longitudinal, school-based, randomized prevention trial. Participants completed yearly surveys starting in 7th-grade and concluding in 10th-grade (N = 7,819). Results indicated that individual risk factors increased with age, while family risk factors, school protective factors, and community protective factors remained consistent across time. Peer risk factors exhibited a curvilinear pattern that peaked between the ages of 14 to 16 (between grades 9 and 10), and decreased after age 16. These results indicate that peer risk factors exert less influence on adolescent substance

use during early and late adolescence, while peer influence on adolescent substance use is most salient during mid-adolescence.

Fleming, Catalano, Haggerty, and Abbott (2010) conducted a study that examined how the growth of risk and protective factors across two developmental periods (grades 5-8 and grades 9-12) predicted substance misuse and crime at age 19. The study utilized yearly survey data from a total of 1,040 adolescents who had participated in a prevention study conducted in a suburban Pacific Northwest school district. The risk and protective factors that were examined in this study fell within the domains of family, school, and peers. Results indicated that changes in positive family relationships and negative peer behaviors predicted substance misuse and criminal behavior at age 19. It is important to note that this study did not examine moderating relationships between protective factors and risk factors, which was one area that the researchers indicated would be important to examine in future research. Fleming et al. (2010) noted that changes in risk and protective factors as adolescents transition across developmental stages can be used to identify adolescents that would likely benefit from targeted prevention or intervention efforts. In addition, results from this study indicate that efforts that seek to ameliorate risk factors and promote protective factors may reduce problematic behaviors during the transition into early adulthood.

Tang and Orwin (2009) conducted a longitudinal research study that examined the effects of parental and peer risk and protective factors associated with initiation of marijuana use across developmental stages (ages 10 to 17). This study utilized survey data from the National Survey of Parents and Youth collected from 1999 to 2004. The participants were children and adolescents who had never used marijuana (N = 4,607),

and their parents, who completed yearly surveys. Results indicated that the general effects of parental factors were significant between the ages of 12 to 14, while peer factors were significant between the ages of 12 to 15. Although results provided some support to the body of research that has found decreasing parental influence and increasing peer influence on adolescent substance use across adolescent developmental stages, Tang and Orwin noted that their study was limited in the number of risk and protective factors that were included in the analysis, and also indicated that exploring additional domains as well as possible moderators or mediators would be beneficial topics for further research. It is also important to note that marijuana initiation was the outcome measured by this research study, which limited the interpretation of the results to this one outcome. Additional analysis of a broader number of drugs as well as differing levels of use may also provide important information for future research as well as prevention and intervention efforts.

Ellickson et al. (2004) conducted a longitudinal study of a diverse sample of adolescents from 7th (N = 1,955) to 10th (N = 909) grade who completed yearly surveys that assessed risk and protective factors as well as problem behaviors such as adolescent substance use. Results from this study indicated that peer substance use was the most predictive risk factor for younger adolescents. Older sibling drug use and the quality of the parent-child relationship were the next strongest predictive factors associated with initiation of marijuana use with younger adolescents, while peer approval of marijuana use was the most important for older adolescents. These results indicate that parental influence, in this case, parent-child relationship quality, appears to be stronger with younger adolescents and decreases in strength as adolescents become older; however, the

findings also indicate that peer influence, through peer substance use or peer approval of substance use, is a powerful factor across adolescent development.

In a research study that examined adolescent alcohol use, Kelly et al. (2012) analyzed the relative susceptibility of youth (10 to 12 years old) and older adolescents (13 to 14 years old) to peer influence to drink alcohol. The data used for the analysis consisted of results from surveys administered to Australian adolescents in grades 6 and 8 (N = 7,064). Results from the study found that, when at least one peer consumed alcohol, grade 6 participants experienced a significantly greater risk of alcohol use than 8th-grade participants. Essentially, results indicated that 6th-grade participants were more susceptible to peer influence than 8th-grade participants (Steinberg & Monahan, 2007). This difference may be due in part to the relatively important roles that peers play in the social lives of younger adolescents, despite the fact that younger adolescents have less experience and relatively fewer coping skills. It also is important to note that levels of use were significantly lower for participants between the ages of 10 to 12 than they were for the older participants, which is consistent with use rates in the United States. The differences between the younger and older samples may have played a role in these results given that the adolescents who reported substance use at a younger age, often referred to as early initiators, are likely to differ significantly from those adolescents who initiate drug use at an older age. Essentially, the effects associated with risk and protective factors on the smaller sample of users in the younger group may not have been representative of the effects on the more heterogeneous population of users found within the older age group, indicating that extrapolating these results to the broader adolescent population may be problematic.

A research study conducted by Duan, Chou, Andreeva, and Pentz (2008) utilized longitudinal data collected from the Midwestern Prevention Project, which was a drug abuse prevention trial that collected annual survey data from 6th-grade through 12th-grade (N = 1,040). They found that perceived peer drug use and norms were predictive of increases in individual adolescent drug use across all adolescent developmental time periods, although middle school-aged adolescents experienced stronger correlations between their own alcohol and marijuana use and peer norms and drug use. This finding is consistent with studies that have found a stronger relationship between peer influence and adolescent drug use during earlier stages of adolescent development. The researchers also compared the correlations between peer drug use and peer norms associated with drug use and found that peer drug use had a higher correlation with adolescent drug use than peer norms.

Overall, research indicates that peer substance use is a particularly important factor and is highly correlated with adolescent substance use across adolescent development. Some research indicates that this influence increases with age; other research indicates that this influence is curvilinear, peaking in middle adolescence and decreasing in later adolescence; whereas other research indicates that peer influence may be strongest during early adolescence. One possible explanation for these conflicting findings may be that studies are analyzing slightly different groups. Those studies that find increased influence of peers on younger adolescents are possibly examining the influence that is exerted on a subgroup of early initiators who are particularly susceptible to peer influence, while those studies that find general increases in peer influence across adolescence may be analyzing influences across broader adolescent groups that may be at

somewhat lower levels of risk when compared to earlier initiators. The following section examines some of the factors associated with peer substance use and its correlation with individual adolescent substance use.

Peer Substance Use

The relationship between peer substance use and adolescents' own substance use has been analyzed in multiple studies with results clearly indicating that there is a strong positive relationship between these two factors (Cleveland et al., 2008; Ennett et al. 2006; Galea, Nandi, & Vlahov, 2004; Garnier & Stein, 2002; Olds & Thombs, 2001; Steinberg, Fletcher, & Darling, 1994; Windle, 2000). While some might assert that the relationship between peer substance use and adolescents' own use is self-evident, a clearer understanding of this relationship provides researchers and other professionals with empirical data that improve research and prevention efforts. A closer examination of this relationship and how it relates to prevention of adolescent substance use follows.

Steinberg and Monahan (2007) point to one important clarification that is often overlooked when examining peer influence, which is that influence can be exerted to increase a variety of behaviors that may be positive, neutral, or negative. This is an important distinction given that recent research within the area of peer influence has predominantly focused on peer influence that leads to negative behaviors or outcomes such as adolescent substance use. They also note that many of the reported research findings, which have often found curvilinear or consistently increasing trends in peer influence over the course of adolescent development, have been based on research that examines antisocial peer influence. Given that results from the majority of research

studies are based upon antisocial peer influence, findings should be interpreted specifically within the context of antisocial peer influence rather than within a broader interpretation of overall peer influence on adolescent behaviors (Steinberg & Monahan, 2007).

Steinberg and Monahan (2007) utilized data from two cross-sectional studies and one longitudinal study to examine peer influence broadly, which included negative, neutral and positive behaviors, across adolescent development and into adulthood. The samples used for this study consisted of four ethnically and socioeconomically diverse samples (N = 3,676) of individuals who ranged in age from 10 years old to 30 years old. Results indicated that resistance to peer influence increased linearly over the course of adolescence, particularly between the ages of 14 to 18 years old. Results also indicated that there was little evidence that resistance to peer influence increased between the ages of 10 to 14 years old. While the linear pattern was consistent between genders, overall resistance to peer influence was greater for females than it was for males. Steinberg and Monahan also found that African American participants were the least susceptible to peer influence, Asian American participants were the most susceptible to peer influence, whereas White and Hispanic participants' susceptibility to peer influence both fell in between the other two groups. They also found that participants with higher socioeconomic status exhibited lower resistance to peer influence at the age of 14, although over time they did catch up with lower socioeconomic participants. Steinberg and Monahan indicated that additional research is needed in the area of peer influence that examines socioeconomic status.

Duncan, Tildesley, Duncan, and Hops (1995) conducted a 4-year research study

of the substance use of 345 adolescents between the ages of 11 and 18 years old. They found that initial AMC use were strongly affected by peer influence, and that continued high levels of use were also associated with peer influence. A research study conducted by Dishion and Owen (2002) analyzed the relationship between deviant friendships, which were defined as friendships that actively encouraged delinquent or antisocial behavior, and individual adolescent substance use. This study utilized 206 participants from the Oregon Youth Study and their friends, beginning at the ages of 13-14 up until the ages of 22-23 years old. Parent and child interviews, videotaped interactions, school data, and court records were all used to assess the relationship between adolescent substance use and deviant friendships. Dishion and Owen found that the tendency to cluster into peer groups that use drugs was the strongest correlate of individual adolescent substance use. In addition, they found that drug use connected individuals within peer groups in a manner that may have facilitated deviant relationships and peer interactions. Results from these research studies indicate that initiation and continued use of drugs by adolescents are correlated with peer substance use.

In 2006, Ennett et al. analyzed the relationship between adolescent substance use and peer social networks. In this study, 5,104 6^{th}-, 7^{th}-, and 8^{th}-graders were surveyed every 6 months over the course of approximately 2 years. Adolescents had a greater likelihood of using alcohol, cigarettes, or marijuana when their best friend reported use, when more friends within their social network reported use, and when there was closer social proximity to a substance user (even if the substance user was not among the adolescent's set of friends). Results also indicated that adolescents at the extremes of either high or low social embeddedness were more likely to use substances than those

found in the middle. Results from this study indicate that adolescent drug use is correlated to friends' substance use, and that social proximity and embeddedness are two mechanisms that may mediate this correlation.

In a cross-sectional study conducted by Lundborg (2006), 3,027 Swedish adolescents from the ages of 12- to 18-years old were surveyed to examine the effect of peer relationships, specifically within the classroom setting, on adolescent binge drinking, smoking, and illicit drug use. Significant and positive relationships between peer effects and all three of the substances were found, with the magnitude of the peer effect being the largest for binge drinking, and the smallest for illicit drug use. Lundborg notes that the higher magnitude was found to occur with the most common behavior, binge drinking, while the smallest occurred with the least common behavior, illicit drug use. Although not explicitly noted in much of the research conducted on the relationship between peer substance use and adolescent substance use, it is likely that a significant portion of peer influence that is measured in many of these research studies occurs within, or is associated with, larger settings such as the community or school settings.

Trucco, Colder, and Wievzorek (2011) conducted a longitudinal research study that examined perceived peer attitudes about drug use as a mediator between peer delinquency and initiation of alcohol use by young adolescents. The researchers also examined the associated effects of parental warmth and control, which were measured by 10 survey items that assessed parenting responsiveness and demandingness. The 371 participants were between the ages of 11 and 13 years old and predominantly White (83%). The adolescent participants and their parents completed questionnaires at an initial assessment and again one year later. Results indicated that peer approval and use

of alcohol predicted future adolescent initiation of alcohol use. Trucco et al. (2011) determined that peer reinforcement and modeling were important mechanisms of peer influence on adolescent initiation of alcohol use. They also found no support for parental warmth or control as moderators of peer influence, although low reliability in the parenting measures as well as low rates of reported initiation of alcohol use may have resulted in low power to detect moderation.

Pomery et al. (2005) conducted a research study of 225 African American families that examined the influences of peers, parents, and older siblings on younger adolescent substance use. Results indicated that older siblings' willingness to use substances and peers' substance use predicted later use of substances by younger siblings. In addition, when older siblings' behavioral willingness to use substances was low, the association between peer influence and adolescent substance use was lessened, indicating that sibling relationships may act as a moderating factor. A study conducted by Windle (2000) also found that sibling substance use was positively correlated with adolescent substance use, and that this relationship was partially mediated by peer substance use. Whereas results from these studies support previous findings regarding peer substance use and adolescent substance use, they also indicate that other individuals, such as siblings, may influence this relationship.

As can be seen in research discussed above, peer substance use is highly correlated with adolescent substance use, and has been shown to occur across settings, grade or age groups, and multiple ethnic and cultural groups. While this correlation has strong empirical support, the underlying mechanisms associated with it are not well understood. Two important mechanisms that are often examined and debated are peer

influence and peer selection.

Peer Selection Versus Peer Influence

Peer influence and peer selection are two areas often cited as fundamental contributors or mediators of the effects of peer substance use on adolescent substance use. *Peer influence* is the mechanism where the peer group causes or influences an adolescent to use drugs (Ennett & Bauman, 1994). An example of this might be an adolescent who initiates use of marijuana as a result of peers normalizing marijuana use (i.e., lessening the adolescent's negative perception of marijuana use) and directly offering the drug to the adolescent. *Peer selection* occurs when the shared behavior of the adolescents in the group causes the formation of a peer group that engages in drug use and reinforces the individual adolescent's use (Ennett & Bauman, 1994). An example of this might be a group of adolescents who have previously experimented with marijuana use individually, who ultimately form a peer group that shares the desire to smoke marijuana and encourages drug use, which in turn increases the level of drug use by individuals within the group. Ennett and Bauman (1994) utilized a sample of 926 adolescents to study the homogeneity of cigarette smoking within adolescent peer groups and to analyze the effects of selection versus influence. Results from this study indicate that both selection and influence contributed to the homogeneity of cigarette smoking within adolescent peer groups. Wills and Cleary (1999) also conducted a study that examined the effects of peer-selection versus peer-influence on adolescent substance use. Two groups of 6th- through 9th-grade adolescents, 1,190 in the first and 1,277 in the second, completed self-report questionnaires once a year over the course of 3 years.

Results from their analysis led Wills and Cleary to conclude that the positive relationship between peer substance use and adolescent substance use is likely due to the peer-influence mechanism rather than a peer-selection mechanism. Norton, Lindrooth, and Ennett (1998) similarly found that peer influence had a greater effect on adolescent substance use than the effect of peer selection. Simons-Morton and Chen (2006) found that peer selection and influence were both significant factors associated with adolescent substance use, although results provided stronger support for the effects associated with peer influence. In contrast, Dishion and Owen (2002) and Fallu et al. (2010) attributed the greater part of adolescent use to peer selection rather than influence.

Conflicting research findings have made it difficult to conclusively determine whether the substance use of peers affects adolescent substance use through the mechanism of selection, influence, or a combination of both. Despite the difficulty in disentangling these concepts, as noted above, the general relationship between peer use and adolescent use is well established, and has been associated with a variety of other factors. Factors such as sibling drug use, attachment to home and school, and parental monitoring are examples of factors that likely mediate or moderate the correlation between friends' substance use and adolescent drug use. Understanding how these and other factors affect this relationship can inform research and prevention efforts. One important area that lends itself to intervention and prevention efforts is parental influence.

Parental Factors Associated With Adolescent Substance Use

As noted earlier, risk and protective factors are often examined within the broader domains of individual, family, community, peer, and school. Within the family domain,

parental factors have been the subject of a great deal of research literature in a variety of areas. Research studies have found that parental factors can affect the behavior of adolescents across a broad range of behaviors such as littering (Reno, Cialdini, & Kallgren, 1993), school failure (O'Donnell et al., 1995), criminal misconduct (Fleming et al., 2010) and substance use (Steinberg et al., 1994). When examining the effects of risk and protective factors, it is important to note that many of these factors fall along a continuum of distal, meaning the influence of the factor is more distant and less direct, to proximal, meaning the influence of the factor is nearer and has a more direct influence. Parental factors are often viewed as proximal factors given that parental roles and practices affect adolescents directly within the family, individual, and community domains, and more indirectly across the peer and school domains as well. Within the area of risk and protective factors associated with adolescent drug use, a substantial amount of research has linked parental factors with adolescent substance use (Cleveland, Feinberg, & Greenberg, 2009; Elek, Miller-Day, & Hecht, 2006; Ennett et al., 2008; Fallu et al., 2010; Guo, Hill, Hawkins, Catalano, & Abbott, 2002; Gutman, Eccles, Peck, & Malanchuk, 2011; Steinberg et al., 1994). This section will explore current research literature that has examined parental risk and protective factors associated with adolescent substance abuse.

A research study by Steinberg et al. (1994) examined the relationship between parental monitoring, peer influence, and adolescent substance use. In this study, 6,500 high school students from California and Wisconsin completed questionnaires that measured peer substance use and peer influence, parental monitoring, and substance use on two separate occasions over the course of 2 school years. Results indicated that

parental monitoring was negatively related to adolescent substance use, while peer substance use was positively related to adolescent substance use. Interestingly, they also found that once adolescent boys initiated substance use their pattern of use became similar to their friends', and was not affected by levels of parental monitoring. In contrast, once adolescent girls initiated substance use their pattern of use was influenced by parental monitoring as well as by their friends' substance use. Cleveland et al. (2009) found that parental supervision as well as effective disciplinary techniques had a relatively greater effect on adolescent substance use than other parental factors such as attachment, opportunities for prosocial involvement, and rewards for prosocial involvement.

A longitudinal study conducted by Gutman et al. (2011) utilized data collected from European American and African American families to analyze the relationships between adolescent alcohol and cigarette use and quality of family relations. Parents and adolescents (n = 1,102 for cigarette use; n = 1,160 for alcohol use) completed questionnaires on four separate occasions, which occurred during 7th-, 9th-, and 11th-grade and after 12th-grade. Results from this study indicated that negative family interactions were associated with current and future increased adolescent cigarette and alcohol use, whereas positive identification with parents was associated with decreased current and future alcohol and cigarette use. The authors hypothesized that better relationships with parents may decrease the likelihood of adolescents associating with peers that are engaged in problem behaviors such as drug use. Ennett et al. (2008) conducted a research study that also found that parental factors moderate the influence of peers on adolescent substance use. In this study, Ennett et al. utilized data from a longitudinal

study that examined intrapersonal and environmental factors that influence adolescent alcohol use and other problem behaviors. The sample consisted of 6,891 participants from 6th-to 8th-grade who completed surveys every 6 months over the course of 2 years. School social network analyses based upon friendship nominations were also conducted as well as random samples of parents completing phone surveys. Ennett et al. found that only adolescents with problem behaving friends who had uninvolved parents were at increased risk of initiating smoking, whereas parental supervision and family closeness were both found to be consistently strong protective factor across adolescent development. These results were consistent for both genders, for Whites and African Americans, and for adolescents in single parent families. Results from these two studies indicate that prevention efforts that target parent-adolescent relationships are likely to produce benefits, some of which are likely to be long-term, in the prevention of adolescent drug use, in part by increasing family protective factors as well as reducing adolescent association with drug-using peers (Ennett et al., 2008; Gutman et al., 2011). It is important to note that both studies utilized samples with White and African Americans, but did not include other ethnic or racial groups such as Hispanics.

Henry (2008) conducted a research study that examined the relationships between adolescent substance use and poor family attachment, poor school attachment, and involvement with friends who use drugs. In this study 1,065 6th- and 7th-graders who were in a no-treatment control group within a larger drug prevention study completed four surveys over the course of 2 years. Results indicated that the relationship between poor family attachment and adolescent substance use was mediated through poor school attachment and involvement with friends who use drugs. Additionally, the relationship

between poor school attachment and adolescent substance use was mediated by involvement with friends who use drugs. The model of poor family attachment, poor school attachment, and involvement with friends who use drugs accounted for 33.6% of the variance in cigarette scores, 29.6% of marijuana score variance, and 30.4% of the variance in alcohol scores. Results from this study indicate that factors such as family attachment and school attachment are areas that are likely associated with adolescent involvement with friends who use drugs.

A study that examined the effects of norms on early adolescent substance use was conducted by Elek et al. (2006). The study utilized preintervention survey data from 4,030 Hispanic, African American, and White 7th-graders (72% Hispanic, 19% White, and 9% African American) from 35 Phoenix, AZ public middle schools who participated in the Keepin' it R.E.A.L. substance abuse prevention program. The researchers specifically examined and compared the influence of injunctive, personal, and descriptive norms. Elek et al. (2006) indicated that injunctive norms are based upon perceptions of what people should do, and influence behavior by associating externally imposed rewards or punishments by others such as parents or peers, whereas descriptive norms are based upon perceptions of the behaviors that the majority of people exhibit, and personal norms are based on internalized norms and values regardless of external influences. Overall, the researchers found that personal norms were the most highly correlated with drug use, while parent and peer injunctive norms and descriptive norms also had significant, although weaker, correlations to early adolescent substance use. Elek et al. also found that parental influence was more strongly associated with past 30-day adolescent drug use than peer influence, whereas lifetime use was more strongly associated with peer

influence than parental influence. The association between norms and increased likelihood of substance use was stronger for boys than it was for girls. It is important to note that this study utilized a younger adolescent sample (7th-graders), which indicates that these results may differ with older adolescent populations.

Injunctive norms are based upon the supposition that engaging in particular behaviors such as substance use has accompanying social rewards and punishments from parents, family members, relatives, friends, peers, or other members of the community (Elek et al., 2006; Kam & Cleveland, 2011; Parsai et al., 2008). Given the assumption that an adolescent has to adopt or accept injunctive norms for them to influence his or her behavior, it is also reasonable to assume that the strength of bonds between adolescents and their parents and other important individuals within their ecological environments, would influence the likelihood of injunctive norm adoption and would moderate this effect. Since the quality of the parent-adolescent bond is a factor correlated with adolescent drug use, an argument can be made that stronger parental bonds may lead to an increased correlation between parental injunctive norms regarding substance use and an adolescent's substance use, whereas weaker parental bonds would decrease the correlation between parental injunctive norms and an adolescent's substance use. The findings that quality of parent-adolescent relationship or bond is significantly correlated to a decreased likelihood in adolescent substance use (Ennett et al., 2008; Gutman et al., 2011; Mogro-Wilson, 2008) seem to indicate that this assumption is likely to be true, at least within the family context.

Guo et al. (2002) conducted a longitudinal study that examined the effects of family, peer, and sociodemograhic factors on the initiation of illicit drug use from the

ages of 12 to 21. This study utilized data from 808 students who participated in the Seattle Social Development Project, which was a longitudinal study conducted from 1985 to 1996 that examined the development of positive and antisocial behaviors across development. The sample used in the study was diverse (46% White, 24% African American, 21% Asian American, 6% Native American, and 3% Other), and included a significant number of participants from lower income families as measured by those participating in the National School Lunch and School Breakfast program, which was 52% of the sample. Data consisted of results from yearly survey data collected from students as well as less frequent survey data collected from parents. Guo et al. (2002) found that the strongest family predictors of decreased likelihood of initiating illicit drug use were clear family rules and monitoring as well as family bonding. They also found that higher rates of peer antisocial behavior were highly correlated with initiation of illicit drug use. One interesting finding was that the influence of family bonding began to decrease at the age of 18, while the influence of peer antisocial behaviors began to increase at the age of 15. The researchers noted that few differences were found between genders and different ethnic groups, with family monitoring, rules, and bonding being slightly more predictive for males than for females and more predictive for Whites than for African Americans. It is important to note that Hispanic adolescents were not identified or included in this study.

In a recent study conducted by Ford (2008), the influence of family and school bonds on adolescent nonmedical prescription drug use was examined. This study utilized data from the 2005 National Survey on Drug Use and Health. The sample consisted of a national demographically representative sample of 18,678 respondents between the ages

of 12 to 17. Results indicated that adolescents with stronger bonds to parents and to school were less likely to report nonmedical prescription drug use, with bond to school being the more robust of the two factors. The author hypothesizes that this difference could be due to many parents viewing nonmedical use of prescription drugs as less detrimental than other drug use. Adolescents from low-income families (annual family income less than $20,000) were at increased risk for nonmedical prescription drug use. Ford (2008) recommended that additional research in the area of nonmedical prescription drug use should examine gender differences and should utilize analyses that include other drugs.

Fallu et al. (2010) recently conducted a longitudinal study of family and peer protective factors associated with adolescent drug use. Specifically, Fallu et al. examined how these protective factors might reduce the risk of disruptive boys from becoming heavy substance users. This ongoing longitudinal study began with 1037 6-year-old kindergarten boys in 1984 who attended schools in low socioeconomic areas in Montreal, Quebec. Three waves of data collection were used in the study. First, disruptiveness was evaluated when participants were aged 6 to 10, substance use was then measured at ages 14 to 15, and protective factors were examined between the ages of 12 to 14. Results indicated that parental monitoring reduced the risk of heavy substance use by disruptive boys; however, a particularly interesting finding was that this relationship was changed when adolescents experienced low parental attachment and high rates of parental monitoring, which resulted in an increase in the risk of heavy substance use. Fallu et al. note that this may be attributable in part to how parental attachment may affect the adolescent's perception regarding parental monitoring, with adolescents who have a

stronger attachment to parents viewing the monitoring as legitimate and an indication of genuine parental concern, whereas adolescents who have lower attachment may view the monitoring as a more negative attempt to control them or undermine their freedom. The authors also recommend that researchers analyze attachment as well as parental monitoring jointly in future research studies that examine these protective factors. A fundamental component of the SDM is the influence exerted by socializing agents such as peers or parents is the strength of the attachment or bond that occurs between the individual and socializing agents. Other studies have also concluded that the quality of the relationship contributes directly to the effects of parental, peer, and other socializing agents (Ennett et al., 2008). One could argue, that given these results as well as the theoretical importance of attachment within the SDM, research examining the effects of protective factors across domains such as peer, school, or community should be examined conjointly with levels of attachment.

Overall, research indicates that parental risk and protective factors are consistently correlated with adolescent substance abuse. While some researchers have found inconsistent results regarding the strength of this relationship across adolescent development, it is important to note that family factors should be analyzed within broader contexts as adolescents become older and gain greater autonomy and experiences outside of the family setting that are likely to exert influence on adolescent behavior. The following section delves into substance abuse research that analyzes factors that fall within the broader context of community.

Community Factors Associated With Adolescent Substance Use

While the community domain is likely to contain many distal factors that influence adolescent substance use, multiple studies have found significant community risk and protective factors that influence adolescent behavior, particularly within the area of substance use. In addition, the effects of many proximal factors, particularly family factors, associated with adolescent substance use are best understood when analyzed within broader social contexts (Cleveland et al., 2009). A significant number of community-level risk and protective factors associated with adolescent substance use have been identified and examined across multiple research studies (Cleveland et al., 2010; Hawkins, Horn, & Arthur, 2004; Van Horn, Hawkins, Arthur, & Catalano, 2007). These studies have examined factors such as neighborhood cohesion, sense of belonging, community attachment, opportunities for prosocial involvement, norms favorable to drug use, access to drugs and alcohol, and enforcement of substance use laws (Cleveland et al., 2010). This section will provide an analysis of current substance abuse research literature that has focused on community risk and protective factors.

Hawkins et al. (2004) conducted a study that examined the variability of individual, peer, family, school, and community risk and protective factors across different communities to determine if these factors contribute to differences in adolescent substance use. The researchers utilized Communities That Care (CTC) survey data from a geographically diverse U.S. sample of 28,091 6^{th}-, 8^{th}-, 10^{th}-, and 12^{th}-graders. The sample was made up of 81% White, 4% African American, 8% Hispanic, 3% Asian American, 3% Native American, with the remaining 5% reporting Mixed Race or no response. The community risk and protective factors that were analyzed included

neighborhood attachment, community disorganization, transitions and mobility, norms favorable to drug use, laws favorable to drug use, perceived availability of drugs, and rewards for prosocial involvement. Results indicated that adolescent substance use rates and levels of the risk and protective factors varied significantly between communities. Differences between communities in levels of risk and protection in all areas, with the exception of the school domain, were significantly related to community levels of adolescent substance use. These results indicate that community level factors play an important role in influencing adolescent substance use. Hawkins et al. (2004) note that these results support the feasibility of reducing targeted risk and protective factors within communities based upon the specific needs within each community. Essentially, prevention efforts can be tailored to the needs of each individual community.

Van Horn et al. (2007) examined the effects of community factors on adolescent substance use in a study that utilized Communities That Care (CTC) survey data from 30, 978 students in 6^{th}-, 8^{th}-, 10^{th}- and 12^{th}-grade from 41 geographically diverse communities as well as data collected from telephone interviews with 612 community leaders (e.g., mayors, police chiefs, business leaders and religious leaders) who had knoweledge of substance use prevention activities within the communities. The researchers analyzed the correlation between four community risk and protective factors that included community norms favorable to substance use, community law enforcement permissiveness of substance use, low community attachment, and community disorganization. Results indicated that students who lived in communities with higher reported levels of disorganization, low community attachment, law enforcement permissiveness of substance use, and norms favorable to substance use reported higher

levels of substance use. It is interesting to note that the community leaders' ratings on community risk and protective factors were somewhat less predictive of substance use outcomes than ratings provided by adolescents. Overall results, however, indicate that community factors, validated by adolescent self-reported perceptions as well as ratings from community leaders, are significantly related to adolescent substance use.

Cleveland et al. (2010) conducted a study that examined the association between individual risk factors and community, school, and family risk and protective factors. The study utilized survey data collected in 2005 from 8,879 12th-grade students (51% female, 9.99% non-White) from Pennsylvania public schools. Results from this study found that adolescents with high levels of individual risk factors such as sensation seeking, rebeliousness, and belief in an immoral order benefited less from family, school, and community protective factors. This type of interaction is often referred to as "protective but reactive," which is an interaction that occurs when a moderating factor provides benefits that dissipate in the presence of risk factors that exert greater influence on behavior (Cleveland et al., 2009; Cleveland et al., 2010). Understanding this type of interaction is particularly important when examining the influence of particularly potent risk factors such as friends' drug use that have consistently been found to have a strong positive correlation with adolescent drug use (Cleveland et al., 2008; Ennett et al. 2006; Galea et al., 2004; Olds & Thombs, 2001; Steinberg et al., 1994; Windle, 2000). Improved understanding of the protective but reactive interactions associated with friends' drug use and other protective factors will likely lead to improved intervention and prevention efforts that are more effective in mitigating the effects of peer influence on adolescent substance abuse. Conceptually, given that individual risk factors

associated with adolescent drug use can reduce the effect of broader protective factors (Cleveland et al., 2010), one would expect that cultural differences associated with risk and protective factors would lead to protective but reactive relationships that would also vary between ethnically and culturally diverse populations.

Cleveland et al. (2009) noted that in contrast to the protective but reactive effect, there is also what is often referred to as a "protective-enhancing effect." This refers to the increased protective effects of factors such as family warmth and consistent discipline, which can act as protective buffers that moderate the influence of broader risk factors. For example, one might find that the protective factor of parental monitoring has a greater impact on adolescent substance use outcomes within a higher risk community environment than it does within a lower risk community environment. Cleveland et al. (2009) conducted a research study that analyzed the effects of family protective factors within lower and higher risk school environments. The researchers utilized anonymous survey data from a sample of 48,641 Pennsylvania students (83% White, 8% African American, and 7% Hispanic) from grades 6, 8, 10, and 12. This analysis looked at the effects of family protective factors that included attachment, opportunities and rewards for prosocial involvement, supervision, and discipline on adolescent substance use across school contexts that had varying levels of aggregated risk factors. The researchers found that individual family protective factors exerted greater influence within schools with higher levels of aggregated protective family factors. In contrast, individual family protective factors exerted weaker influence on adolescent substance use when aggregated family risk factors within the school setting were higher. These findings are consistent with the concept of protective but reactive effects, indicating that higher risk

environments were associated with decreased effectiveness of some family protective factors, whereas lower risk environments were associated with improved effectiveness of the same family protective factors. Cleveland et al. note that these findings are consistent with prior research that has found that community protective factors are associated with decreased risk of adolescent negative behaviors.

When implementing prevention and intervention supports within family contexts it is important to recognize how the larger community environments might exert influence on such supports. These considerations are likely to be important within the environments of culturally diverse populations. Given that many families of adolescents from diverse backgrounds are connected to broader cultural and social contexts that are likely to vary from the contexts of many White adolescents, one would expect that these influences would also vary in their interactions with individual and family factors. The following section analyzes the substance abuse research literature within the context of culturally diverse populations.

Cultural Factors Associated With Adolescent Substance Use

Although there is an abundance of research examining risk and protective factors associated with adolescent drug use, there has been a relative lack of research examining these factors within minority populations (Bersamin et al., 2005; Botvin et al., 2001; Chen et al., 2012; Szapocznik, Prado, Burlew, Williams, & Santisteban, 2007; Wallace & Muroff, 2002). Many theories of substance use make the assumption that risk and protective factors are universally applicable to youth regardless of ethnicity, cultural background, race, or gender (Griffin et al., 2000). Chen et al. (2012) note that some

research examining risk and protective factors associated with adolescent drug use has found that the effects of risk and protective factors are consistent across racial and ethnic groups; however, they also noted that many of these studies utilize samples that do not contain adequate numbers of ethnic minority participants. In contrast, other researchers have found significant differences between risk and protective factors associated with drug use across racially and ethnically diverse populations (Bersamin et al., 2005; Choi, He, Herrenkohl, Catalano, & Toumbourou, 2012; Chen et al., 2012; Griffin et al., 2000; Wallace & Muroff, 2002). Some researchers have hypothesized that minority adolescents are more likely to have weaker social bonds to conventional social institutions, such as schools or local community organizations, than those of White adolescents, which may in turn reduce or exacerbate effects associated with ecological risk and protective factors (Chen et al., 2012). Cultural differences in the norms and environmental factors can be found across ethnically and racially diverse groups. Given these differences, one would expect that effects of risk and protective factors would vary between ethnic and cultural groups. The following section will examine some of the similarities and differences between risk and protective factors associated with adolescent substance use across racial, ethnic, and cultural groups, with an emphasis being placed on Hispanic adolescents due to the focus of the current study.

Griffin et al. (2000) conducted a longitudinal study that analyzed the cumulative effects of risk and protective factors on adolescent alcohol use. The researchers utilized self-report questionnaire data from black (n = 775) and Hispanic (n = 467) inner-city youth, as well as self-report questionnaire data from White suburban youth (n = 708). Data was collected in 7th-grade and then once more in 9th-grade. Black adolescents

reported the fewest risk factors and lowest levels of alcohol use, White adolescents reported the highest levels of risk factors and alcohol use, Hispanic adolescents reported the fewest protective factors and an intermediate level of alcohol use, and males reported higher levels of risk factors and alcohol use than females. The researchers then measured the effects of overall risk and protective factors from 7th-grade on 9th-grade adolescent alcohol use. Results indicated that the correlation between overall level of risk factors and alcohol use was strongest for White adolescents, followed by Hispanic adolescents, and was lowest for Black adolescents. Findings also indicated that overall level of protective factors significantly attenuated the effects of risk, and that this occurred differentially across subgroups. Level of protective factors had significant moderating effects among Black males and females and Hispanic males, while it did not have significant effects among White males and females and Hispanic females. Chen et al. (2012) found that the effect of parents' disapproval on binge drinking was a stronger predictor of substance use for White adolescents than it was for Native American adolescents.

One risk factor that has been found to consistently correlate with increased adolescent substance use across racial and ethnic groups is peer substance use. Choi, He, Herrenkohl, Catalano, and Toumbourou (2012) noted that peer influence is a consistent predictor of adolescent drug use across racial and ethnic groups and should be universally targeted in prevention and intervention efforts. A 1991 study of 526 ethnically diverse 7th-graders conducted by Graham, Marks, and Hansen (1991) found that adolescent alcohol and tobacco use was positively correlated with peer substance use. In addition, three areas of peer influence were found to individually contribute to this correlation:

active peer influence in the form of explicit offers to use substances, passive influence in the form of social modeling, and overestimation of peer substance use. It is also interesting to note that adolescents with prior use were more affected by peer offers to use drugs than adolescents with no prior use. Another example of this can be found in a 2007 research study in which Galaif et al. examined risk and protective factors associated with adolescent drug use utilizing an ethnically diverse sample of White, U.S. and foreign-born Latino, and African American adolescent boys. They found a strong positive relationship between peer drug use and adolescent drug use across the ethnic groups included in the sample. In another study, utilizing a sample of inner city, predominantly minority adolescents, Epstein, Botvin, and Doyle (2009) found that polydrug use was positively related to friends' smoking and use of alcohol. In a study conducted by Choi et al. (2012), the number of substance-using friends was consistently the most highly correlated factor associated with future problems for White, Hispanic, Asian American, and multiracial youth (Choi et al., 2012). Frauenglass, Routh, Pantin, and Mason (1997) also examined this relationship in a study that utilized a mostly Hispanic sample, and found that friends' substance use increased the likelihood of adolescent substance use among Hispanic youth.

Results from several studies indicate that a correlation between peer influence and adolescent substance use has been consistently found within a wide range of diverse ethnic and cultural groups within the United States (Choi et al., 2012; Frauenglass et al., 1997; Graham et al., 1991). In addition, studies conducted with samples from a wide range of countries, including South Korea (Kim et al., 2010), New Zealand (Fergusson, Swain-Campbell, & Horwood, 2002), Austria (Rumpold et al., 2006), and Canada (Fallu

et al., 2010) have also found that parental and peer influence are significantly correlated with adolescent substance use. While this research supports the cross-cultural importance of peer influence and parental influence across a variety of cultural groups, it is important to note that these results do not indicate that the effects of these or other factors are uniform across cultural groups. For example, Chen et al. (2012) found that friendships with delinquent peers were significantly associated with binge drinking and illicit drug use among White and Mixed-Race adolescents and, to a somewhat lower degree, for Native American adolescents. Choi, He, Herrenkohl, Catalano, and Toumbourou (2012) found that the peer risk factors of drug-using or antisocial friends were higher for multiracial youth than they were for White youth. Bersamin et al. (2005) conducted a research study that examined whether or not 39 risk factors were differentially associated with binge drinking by adolescents from different ethnic minority groups and White adolescents. The researchers utilized data from the 1999 National Household Survey of Drug Abuse (NHSDA), which was administered to adolescent participants as an in-home computer assisted interview. The study sample consisted of 12,583 participants across the United States between the ages of 14 and 17 who identified as White, Black, Hispanic, or Asian. The combined set of risk factors explained approximately 27% of the variation in binge drinking among White adolescents, which varied significantly from the 39% of variation for Asian adolescents, 22% for Hispanic adolescents, and 10% for Black adolescents. A total of 17 of the 39 risk factors (43%) were more strongly associated with reported binge drinking within the past 30 days for White adolescents than for Black and Hispanic adolescents. Fewer significant differences were noted between Asian adolescents and White adolescents, although this may be attributable in

part to the small sample size of Asian adolescents as well as low reported rates of binge drinking by the Asian adolescents who participated in the study. One implication of these results noted by Bersamin et al. (2005) is that the consistently greater association between these risk factors and binge drinking for White adolescents indicates that prevention and intervention programs that target these risk factors are likely to be more relevant, and possibly more effective, for White adolescents than for Black or Hispanic adolescents. It is important to note that this study did not examine these differences as they occur across adolescent developmental stages, different substances, protective factors, or gender.

Given that results from much of the existing research in the area of risk and protective factors is based upon predominantly White samples some have recognized the concern that prevention and intervention efforts may not generalize to minority populations (Bersamin et al., 2005; Chen et al., 2012; Parsai et al., 2008). Researchers who have examined the differential effects of risk and protective factors between racial and ethnic groups have consistently emphasized the importance of considering cultural contexts when developing and implementing prevention and intervention programs (Chen et al., 2012; Choi et al., 2012). As additional research is conducted to better understand some of the racial and ethnic differences between contextual factors associated with drug use, one would expect that improvements in services and supports for diverse populations would also follow. Given the rapid growth of the Hispanic population within the United States, the relative lack of substance abuse research utilizing this population, and the intention to utilize data collected from Hispanic adolescents for the current study, the next section will look specifically at research literature that has analyzed the relationship

between risk and protective factors and Hispanic adolescents.

Hispanic Adolescent Substance Use

A growing body of research indicates that immigrant youth experience an increased risk of substance use as they become more acculturated to mainstream U.S. cultural norms (Saint-Jean, Martinez, & Crandall, 2007; Saint-Jean, 2008; Szapocznik et al., 2007). Saint-Jean et al. (2007) found that adolescents of immigrant descent who speak English at home, when compared to adolescents of immigrant descent who speak another language at home, are more likely to associate with deviant peers, are more likely to live in families with greater tolerance for delinquent behaviors, and are more likely to live in communities with greater access to drugs and firearms. Hispanic adolescents who are born in the United States and who have lived here for more years experience higher rates of substance use and delinquency than Hispanic adolescents who were born outside of the United States and have lived here less time (Szapocznik et al., 2007). In addition, Hispanic adolescents with higher levels of acculturation to predominant U.S. cultural norms experience higher rates of substance use and delinquency. Szapocznik et al. (2007) suspect that this may be attributable in part to increased family risk factors in areas such as low family cohesion and poor family communication. The increase of substance use associated with higher levels of acculturation within the United States is part of a larger pattern often identified as the immigrant paradox (Szapocznik et al., 2007). The immigrant paradox refers to findings that foreign-born Hispanic immigrants exhibit a significant number of better health outcomes than U.S.-born Hispanic individuals, and that recent Hispanic immigrants exhibit better health indicators than

Hispanic immigrants who have been in the United States longer (Szapocznik et al., 2007).

A research study conducted by Saint-Jean (2008) analyzed the effects of acculturation on Hispanic adolescent drug use, with an emphasis being placed on examining differences between genders. The study utilized survey data from 8,200 Hispanic youth between the ages of 10 to 18 who had completed the 2004 Florida Youth Survey. Saint-Jean utilized predominant language spoken at home as a measure of acculturation, with predominantly English being spoken at home indicating increased acculturation. After controlling for sociodemographic characteristics, Saint-Jean found that both male and female participants who spoke predominantly English at home experienced higher levels of risk factors, increased substance use, and lower levels of protective factors than participants who spoke predominantly Spanish at home. In addition, results indicated that male adolescents who lived in homes where English was the predominant language experienced higher levels of negative effects than female students in English-predominant homes. The author hypothesizes that one possible explanation for this result is that the acculturation process for Hispanic female adolescents may actually reinforce some gender-specific cultural norms that act as protective factors for Hispanic girls, while this effect does not occur for Hispanic boys (Saint-Jean, 2008).

Kam and Cleveland (2011) conducted a study that analyzed how perceived discrimination increases acculturative stress, leading to increased use of alcohol, tobacco, and other drugs. They also examined whether parental and peer protective factors could moderate the increased risk to use substances Latino adolescents experience when coping with acculturative stress. They utilized a sample of 728 Latino 7th- and 8th-grade students

from 23 public middle schools in Phoenix, AZ. The participants completed three self-report questionnaires over the course of 2 years. The authors found that Latino adolescents who experienced perceived discrimination experienced increased acculturation stress, which resulted in a greater likelihood of use of alcohol, tobacco, and other drugs (Kam & Cleveland, 2011). The authors concluded that substance use is one way that some Latino youth cope with acculturative stress. Kam and Cleveland (2011) also found that parent and peer protective factors did not mitigate the negative effect of acculturative stress on Latino adolescent substance use; however, they did find that, overall, Latino adolescents who experienced increased parent-child closeness were less likely to use alcohol, tobacco, and other drugs.

Mogro-Wilson (2008) conducted a study that analyzed risk and protective factors associated with Latino adolescent alcohol use. The study utilized survey data from 16,044 Latino adolescents between grades 7 and 12 as well as survey data collected from one of their parents, usually the mother, which was collected as part of the National Longitudinal Study of Adolescent Health. Mogro-Wilson found that stronger parent-child relationships within Latino families decreased the likelihood of adolescent alcohol use. Results also indicated that increased parental warmth within Latino families was correlated with decreased adolescent alcohol use. Mogro-Wilson was unable to analyze which parent contributed to the increased parental warmth that was reported and recommended that future research be conducted to analyze how differences in parental warmth between Latino mothers and fathers may affect adolescent alcohol use. It was also found that decreases in parental control within Latino families contributed to increases in adolescent substance abuse, which is the opposite of the effect that other

researchers have found within non-Latino families (Fletcher & Jefferies, 1999). Mogro-Wilson attributed this finding in part to the view that increased rules and control within Latino families helps maintain family values that contribute to lower levels of adolescent alcohol use by Latino adolescents. One recommendation that Mogro-Wilson made was that additional research studies that examine the effects of Latino parental practices and adolescent alcohol use should include analyses of adolescent use of marijuana and other drugs.

One cultural value that should be considered when examining the influence of peer and families on Latino adolescent substance use is familism. Familism is a commonly held Hispanic value that places significant emphasis on the centrality and importance of family networks (Parsai et al., 2008). Sabrogal et al. (1987) define familism as "a strong identification and attachment of individuals with their families (nuclear and extended), and strong feelings of loyalty, reciprocity and solidarity among members of the same family" (p. 398). One important aspect of familism is the priority that is placed on family interests over the interests of the individual (Parsai et al., 2008). Familism values are considered core cultural values for many Hispanic families and are generally transmitted from generation to generation through interactions that parents have with their children (German, Gonzales, & Dumka, 2008). Another aspect of familism is the belief that children's behavior in public is a reflection on the family unit, which is taught by parents, and it is often expected that older siblings should monitor and be responsible for younger siblings' behavior in public. These expectations appear to reinforce adherence to behavioral expectations within the nuclear family as well as extended family, possibly increasing Hispanic adolescent attachment to family as well as

the family influence on Hispanic adolescent behavior (German et al., 2008). Overall, familism is a protective factor that is relatively unique to Hispanic families and may decrease the likelihood of Latino adolescent substance use (Marsiglia, Kulis, Wagstaff, Elek, & Dran, 2005).

Another important cultural value found within Latino families that may contribute to differing influences on Hispanic adolescent substance use is respeto (Parsai et al., 2008). Respeto, which is literally translated to mean "respect," is a traditional value that teaches children to respect the authority of parents and adults (Parsai et al., 2008). It has been hypothesized that the obligations associated with respeto may influence Hispanic adolescent relationships with their peers by decreasing the likelihood that they will associate with peers who participate in activities or behaviors that are contrary to those that are endorsed by their parents and other adult family members (Parsai et al., 2008). Szapocznik et al. (2007) indicated that one promising area of drug use prevention for Hispanic adolescents is to encourage parents to improve communication with their children, particularly in the area of drug use. While this is a common recommendation for most families regardless of their ethnic background, prominent Hispanic cultural values such as familism and respeto may increase the likelihood of effective outcomes when a treatment or prevention program targets family communication.

Additional cultural values that may be important when analyzing factors associated with Hispanic adolescent drug use, particularly when analyzing gender differences, are the values of machismo and marianismo. Machismo is a cultural value that gives boys greater social freedom while also instilling a sense of accountability and responsibility (Parsai et al., 2008). It has been hypothesized that boys who have been raised with the

values associated with machismo may experience greater exposure to social interactions that could involve opportunities for drug use (Parsai et al., 2008). Marianismo is a cultural value that places greater emphasis on a Latino girl's obligations to her family (Parsai et al., 2008). In a home where the value of marianismo is practiced, girls often experience increased parental monitoring and greater restrictions on their social interactions and freedoms outside of the home or family setting, which may decrease their exposure to social situations that promote drug use (Parsai et al., 2008).

Parsai et al. (2008) conducted a research study that analyzed the effects of parental and peer influences on drug use by 12- to 13-year-old Mexican-Americans in the southwestern United States. This study also examined how peer and parental factors vary due to gender. Parsai et al. (2008) utilized survey data from 2,733 self-identified Mexican-American students from 32 schools in a southwestern city in the United States. They found that parental and peer factors were important predictors of alcohol, tobacco, and marijuana use within the past 30 days. Of particular interest was the association between antidrug parental injunctive norms and reduced alcohol, tobacco, and marijuana use. Antidrug parental injunctive norms were correlated with decreased use of all three substances for boys, whereas it was significant for decreased marijuana and alcohol use for girls but not tobacco use. In addition, the correlations between parents' injunctive norms, friends' drug use, friends' injunctive norms, and marijuana use were significantly greater for boys than they were for girls. These differences may be due in part to differing gender roles within Hispanic culture, although a comparison utilizing similar measures with White adolescents or other ethnic groups would likely provide greater clarity.

Overall, research within the area of risk and protective factors associated with Hispanic adolescent substance use indicates that Hispanic adolescents experience unique cultural values, contexts, and challenges that significantly differentiate their experiences from those of White or other ethnic populations. Although research has been conducted to better understand some of these factors, additional research is needed. A general summary of risk and protective factors discussed in this literature review, as well as the number of studies that utilized Hispanic samples, is included in Table 1. As our understanding of factors associated with Hispanic adolescent substance use improves, the effectiveness of programs and services for Hispanic adolescents and their families will also improve. Given that the U.S. Hispanic population is currently the largest and one of the fastest growing minority groups within the United States (Humes et al., 2011), improved outcomes related to adolescent substance use within this population will result in increasingly larger positive impacts not only within Hispanic communities, but also within the country as a whole.

Research Questions

Based upon the theoretical framework of the SDM as well as evidence from a wide range of research studies cited within this paper (e.g., Henry, 2008; Kaufman et al., 2007; Steinberg et al., 1994; Windle, 2000), risk and protective factors provide a structure for understanding adolescent substance use as well as a variety of potential opportunities for intervening and preventing adolescent substance use. Of the various risk and protective factors discussed in the literature review, the factor of peer substance

Table 1

Research Studies and General Findings Associated With Risk and Protective Factors Discussed in the Literature Review

Risk or protective factor	Research studies	General findings	Number of studies with substantial % of Hispanics in sample*
Peer substance use	Choi et al., 2012; Cleveland et al., 2008; Epstein et al., 2009; Ennett et al. 2006; Ennett et al., 2008; Ennett & Bauman, 1994; Fallu et al., 2010; *Fruanglass et al., 1997**; Galaif et al., 2007**;* Galea, et al., 2004; Garnier & Stein, 2002; Graham et al., 1991; Guo et al., 2002; Henry, 2008; *Kam & Cleveland, 2011**;* Lundborg, 2006; Olds & Thombs, 2001; Norton et al., 1998; Pomery et al., 2005, Simmons-Morton & Chen, 2006; Steinberg, Fletcher, & Darling, 1994; *Steinberg & Monahan, 2007**;* Willis & Clearly, 1998; Windle, 2000;	Associating with peers who use substances is highly correlated with increased risk for adolescent substance use across adolescent development.	4
Parental injunctive norms	Chen et al., 2012; *Elek, Miller-Day, & Hecht, 2006**; Kam & Cleveland, 2011**; Parsai et al., 2008**;*	Parental injunctive norms are correlated with decreased risk for adolescent substance use.	3
Parental monitoring	Cleveland, Feinberg, & Greenberg, 2009; Ennett et al., 2008; Fallu et al., 2010; Guo et al., 2002; *Parsai et al., 2008**;* Steinberg, Fletcher, & Darling, 1994;	Increased parental monitoring is correlated with decreased risk of adolescent substance use.	1
Parental attachment	*Kam & Cleveland, 2011**;* Ennet et al., 2008; Fallu et al., 2010; Ford, 2008; Cleveland, Feinberg, & Greenberg, 2009; Guo et al., 2002; Gutman et al., 2011; Henry, 2008; *Mogro-Wilson, 2008**;*	Higher levels of parental attachment are associated with decreased risk of adolescent substance use.	2
Community attachment	Hawkins, Horn, & Arthur, 2004; Van Horn et al., 2007;	Higher community attachment is correlated with decreased risk of adolescent substance use.	0
Community norms related to drug use	Hawkins, Horn, & Arthur, 2004; Van Horn et al., 2007;	Community norms that view drug use as a negative or non-normative behavior are correlated with decreased risk of adolescent substance use.	0
Level of acculturation	*Kam & Cleveland, 2011**; Saint-Jean et al., 2007**; Saint-Jean, 2008**; Szapocznik et al., 2007**;*	Higher levels of acculturation are associated with increased risk of Hispanic adolescent substance use.	4

*The criteria for this factor was at least 15% of the sample was identified as Hispanic or Latino;
***Designates a study that utilized a substantial number of Hispanic participants (at least 15%)*

use is of particular interest. The relationship between peer substance use and adolescent substance use has been analyzed in multiple studies with results clearly indicating that there is a strong positive relationship between these two factors (Cleveland et al., 2008; Ennett et al. 2006; Galea et al., 2004; Olds & Thombs, 2001; Steinberg et al., 1994; Windle, 2000). Attenuating this relationship could potentially decrease rates of adolescent substance use and promote stronger attachment to prosocial institutions and individuals.

Despite improvement in recent years, understanding differences in magnitudes of associations between risk and protective factors within culturally and ethnically diverse groups continues to be an area in need of further research (Bersamin et al., 2005; Botvin et al., 2001; Chen et al., 2012; Szapocznik et al., 2007; Wallace & Muroff, 2002). As Wallace and Muroff (2002) noted, many substance abuse prevention and treatment programs often make the assumption that factors associated with substance use carry equal effects and importance across racial and ethnic groups. Understanding how factors and pathways associated with substance use might vary across demographic subgroups in areas such as gender, age, and ethnicity will ultimately inform and improve prevention and intervention efforts (Parsai et al., 2008).

A review of the research literature also indicates that there are relatively few studies that have analyzed the effects of specific risk and protective factors associated with Hispanic adolescent drug use across adolescent development (Griffin et al., 2000). Furthermore, no current research has been conducted that compares the effects of risk and protective factors from peer, community, and parental domains on Hispanic adolescent drug use across adolescent development. The current research project seeks to address

these gaps in the literature. The following research questions were targeted:

1) Do higher levels of parental attachment and parental injunctive norms regarding adolescent substance use moderate the relationship between Hispanic adolescent substance use and involvement with drug-using friends? How does this relationship vary based upon grade, gender, socioeconomic status, and level of acculturation?
2) Do higher levels of community attachment and community injunctive norms regarding adolescent substance use moderate the relationship between Hispanic adolescent substance use and involvement with drug-using friends? How does this relationship vary based upon grade, gender, socioeconomic status, and level of acculturation?

CHAPTER II

METHODOLOGY

Participants

The research analyzes data collected from the 2012 Arizona Youth Survey (AYS). Results from AYS were selected due to the significant percentage of Hispanics found within the population of Arizona. The 2012 AYS survey was administered to a total of 62,817 students across the state of Arizona during February and March of 2012. Of this total, 24,099 respondents indicated that they were Hispanic or Latino on the surveys, which was approximately 38% of 8^{th}-, 10^{th}-, and 12^{th}-graders.

The AYS tool includes validity measures to screen for surveys that may include dishonest responses or other problems that could invalidate individual results. Within the 2012 AYS dataset, 1,268 cases were eliminated due to validity concerns as indicated by the following: First, students were asked if they had been honest in completing the survey. If respondents indicated that they were "Not Honest At All" in completing the survey they were eliminated from the sample. Second, the students were asked if they had used a nonexistent drug called phenoxydine. Those students who indicated that they had used phenoxydine were removed from the sample. Students were also removed from the analyses if they reported an impossibly high level of drug use, or if they indicated past-month use rates that were higher than lifetime use rates. Finally, if the students

reported an age that was inconsistent with their grade or their school they were also removed from the sample.

Of the remaining 22,831 participant results, 606 additional cases were removed due to participants coming from a school with less than 15 respondents. This step was taken to ensure that schools with lower numbers of participants would not skew school level results. An additional 7,952 cases were removed from the datasets utilizing listwise deletion when conducting the analyses due to missing data on variables included in the analyses. As a result, a total of 14,273 total participants were included in the study analyses, of which 6,914 were 8th-graders, 4,108 were 10th-graders, and 3,251 were 12th-graders.

Demographic information for participants can be found in Table 2. Based upon recent census data from the Census 2011 American Community Survey, 14.6% of the general population of Arizona over the age of 25 had not received a high school diploma or GED, which was lower than the percentage of study participants who reported that their mother had not completed high school or received a GED (27.5%). Estimates from the Census 2013 American Community Survey also indicate that approximately 33% of Hispanic women in Arizona have not obtained a high school diploma, GED, or higher level of education, which is a rate that is slightly higher than the rates reported by participants in this study. Overall, comparisons between census estimates and demographic information reported by participants indicate that the Hispanic participant samples used in this study are relatively comparable on demographic measures to the general Hispanic population of Arizona.

Table 2

Demographic Information for the Dataset Used in the Analyses

	Count	Percent
Male	6,619	46.4
Female	7,654	53.6
Total	14,273	100
8th Grade	6,914	48.4
10th Grade	4,108	28.8
12th Grade	3,251	22.8
All Grades	14,273	100
Without a High School Diploma	3,929	27.5
High School Diploma or GED	2,717	19
English is the Primary Language at Home	9,350	65.5
Spanish is the Primary Language at Home	4,923	34.5

Instrument, Procedure, and Setting

Coordination and administration of the 2012 AYS was conducted through a collaborative effort between the Arizona Criminal Justice Commission Statistical Analysis Center, Arizona Department of Gaming, Office of Problem Gambling, and Bach Harrison, L.L.C. A request to utilize AYS data was made to the Arizona Criminal Justice Commission Statistical Analysis Center (ACJCSAC). An interagency data sharing agreement between the primary investigator and the ACJCSAC was drafted and signed prior to conducting this research study. This agreement provided written permission and access to data from the 2012 AYS that were used to conduct the research analyses. The current research study also received approval from the University of Utah Institutional Review Board.

The AYS is based upon the Communities That Care Youth Survey (see Arthur et al., 2002) that was developed to:

> (a) assess a broad set of risk and protective factors identified by prospective longitudinal research across the domains of community, school, family, peer, and

> individual as well as health and behavior outcomes, including substance use, violence, and delinquency; (b) be administered within a school setting during one class period (approximately 50 minutes); and (c) be appropriate for adolescents ranging in age from 11 to 18 to allow for assessment of levels of risk and protective factor exposure at difference ages during adolescence. The risk and protective factors selected for inclusion were factors that had been found to predict drug use and delinquent behavior at the individual level in two or more longitudinal studies in which the factors were measured prior to the outcomes of interest. (pp. 577-578)

The authors of the AYS ensured that the strong psychometric properties that were rigorously established in the development and validation of the Communities that Care Youth Survey were maintained (see Arthur et al., 2002 for a thorough review of the procedures and development of the Communities that Care Youth Survey).

Participation in the AYS required passive parental permission. Parents of students received a letter indicating that the survey would be administered. If parents did not want their child to complete the survey they could contact the school and indicate that they did not want their child to participate. If a parent declined, their son or daughter was allowed to read or participate in an alternate activity while his or her classmates completed the survey.

Students across the state of Arizona completed the AYS during February and March of 2012. The 2012 AYS contained a total of 149 questions. Classroom teachers provided blank survey booklets to students during one of their regularly scheduled class periods. The classroom teacher explained the administration procedures, taking particular care to explain the anonymous and confidential nature of the survey. While completing the survey, students were arranged in the classroom so that their responses could not be seen by the teacher administering the survey or by any other students within the classroom. Students were given approximately 45 minutes to complete the surveys,

and teachers were instructed to inform students that they should answer as many questions as possible during the class, but should not be concerned if they were unable to finish all of them in the allotted time. At the end of the class period, the survey booklets were immediately gathered, placed in a box, sealed and mailed to Bach Harrison, L.L.C.

Variables

The AYS measures a variety of risk and protective factors that are organized into scales as well as multiple demographic variables. The following section describes each of the variables that were used in the current study and provides information about the questions that were used to construct each variable. Internal consistency data for each of the scales that include more than one item can be found in Table 3. The general guideline researchers often use when determining if a scale meets internal consistency criteria is a Cronbach alpha score that is above .70 (Tavakol & Dennick, 2011). The Cronbach Alpha scores for the variables used in the analyses are above .70 for all variables except for both of the dependent variables, which were .67 (AMC use) and .64 (PD abuse). These scores indicate that the AMC use variable approaches commonly accepted internal consistency levels, while the PD abuse variable is slightly lower, but also approaches the commonly accepted level.

Tavakol and Dennick (2011) note that a low value of alpha could be due to poor interrelatedness between scale items, a low number of questions in the scale, or a heterogeneous construct. Both of the drug use scales contain three items, which is fewer than the number of items found in many of the other scales. Another possible explanation for lower alpha scores, particularly on the prescription drug abuse variable, may be that

Table 3

Scale Reliability (Cronbach Alpha) for AYS Scales That Contain More Than One Item

Variable	Number of items	Cronbach Alpha
Adolescent Marijuana, Alcohol, and Cigarette Use	3	.67
Adolescent Prescription Drug Abuse	3	.64
Friends' Drug Use	4	.80
Parental Attachment	7	.86
Parental Injunctive Norms	3	.78
Community Attachment	7	.86
Community Injunctive Norms	3	.87

adolescent drug use is specific to one particular drug due to personal preferences, prior experience, and/or access to the drug, which naturally constrains use to one particular drug use category, thus reducing use of drugs in the other categories. Due to the lower number of items within each of the drug use scales, as well as the heterogeneous nature of the substances included in each of the scales, it was determined that lower Cronbach alpha scores did not preclude the use of these scales to measure recent adolescent substance use, particularly given that the aim of the study was to analyze broad drug use.

Demographics

Demographic variables that were analyzed in this study measured grade, gender, home language, self-identification as Hispanic, and socioeconomic status as reported on the AYS. Measures of socioeconomic status included free or reduced lunch status and highest reported level of educational attainment by the participant's mother. A full list of the demographic variables can be found in the Appendix. The following is an example of one of the demographic variable questions on the AYS: "What is the language you use

most often at home?" Possible responses to this question were: English, Spanish, or another language.

Adolescent Use of Alcohol, Marijuana, and Cigarettes

This AYS scale is measured by asking adolescents how much, if any, alcohol, cigarettes, and/or marijuana they have used within the past 30 days. Alcohol, marijuana, and cigarettes were selected for measurement due to higher prevalence of use than other drugs. A full list of the three items included in this variable can be found in the Appendix. The following is an example of one of the questions used in this scale: "On how many occasions (if any) have you used marijuana (grass, pot) or hashish (hash, hash oil) during the past 30 days?" Possible responses to this question were: 0 occasions, 1-2, 3-5, 6-9, 10-19, 20-39, or 40 or more.

Adolescent Abuse of Prescription Drugs

PD abuse was also included in the AYS due to the increasing prevalence of adolescent PD abuse, a lack of empirical research on factors associated with adolescent PD abuse, and a need for research that includes racial and ethnic minorities (Ford, 2008; Schepis & Krishnan-Sarin, 2008; Young, Glover, & Havens, 2012). This measure includes reported use of prescription narcotics, sedatives, and stimulants. A full list of the three items included in this variable can be found in the Appendix. The following is an example of one of the questions used in this scale: "On how many occasions (if any) have you used narcotic prescription drugs (OxyContin, methadone, morphine, codeine, Demerol, Vicodin, and Percocet) without a doctor telling you to take them, in the past 30

days? Possible responses to this question were: 0 occasions, 1-2, 3-5, 6-9, 10-19, 20-39, or 40 or more.

Friends' Drug Use

This AYS scale asked the adolescents to report the use of alcohol, cigarettes, marijuana, or other illicit drugs by their four best friends within the previous 12 months. A full list of the four friends' drug use items for this variable can be found in the Appendix. The following is an example of one of the questions used in this scale: "Think of your four best friends (the friends you feel closest to). In the past year (12 months), how many of your best friends have: Tried beer, wine or hard liquor (for example, vodka, whiskey or gin) regularly?" There were five possible responses: 0, 1, 2, 3, or 4. It is important to note that the correlation between associations with drug using peers and adolescent substance use may be stronger when peer associations are closer (Ennett et al., 2008). Consequently, the wording of this question indicates that the relationships between the adolescent and the "four best friends" that are referred to in the question are likely to be close.

Parental Attachment

This scale on the AYS asked adolescents questions about their attachment to their mother and father. A full list of the seven parental attachment items included in this variable can be found in the Appendix. The following is an example of one of the questions used in this scale: "Do you feel very close to your mother?" The possible responses for this question are "NO!", "no," "yes," or "YES!" Students were given

instructions that indicated that their answers meant the following on the survey: “NO!” meant *definitely not true for him/her*, “no” meant *mostly not true for him/her*, “yes” meant *mostly true for him/her*, and “YES!” meant *definitely true for him/her*.

Parental Injunctive Norms Regarding Substance Use

This AYS scale contains three items that ask adolescents to rate their perception of the level of parental disapproval if he/she were to use a particular drug. A full list of the three parental injunctive norms regarding substance use items for this variable can be found in the Appendix. The following is an example of one of the questions used in this scale: “How wrong do your parents feel it would be for YOU to smoke marijuana?” The possible responses for this question are: very wrong, wrong, a little bit wrong, and not wrong at all.

Parental Injunctive Norms Regarding Prescription Abuse

This scale on the AYS contains one item that asked adolescents to rate their perception of the level of parental disapproval if he/she were to abuse prescription drugs. The question asks: “How wrong do your parents feel it would be for YOU to use prescription drugs without a doctor telling you to take them?” The possible responses for this question are: very wrong, wrong, a little bit wrong, and not wrong at all.

Community Attachment

This AYS scale asked adolescents questions about their attachment to their neighborhood. A full list of the seven community attachment items for this variable can

be found in the Appendix. The following is an example of one of the questions used in this scale: "If I had to move, I would miss the neighborhood I now live in." The possible responses for this question are "NO!", "no," "yes," or "YES!" Students were given instructions that indicated that their answers meant the following on the survey: "NO!" meant *definitely not true for him/her*, "no" meant *mostly not true for him/her*, "yes" meant *mostly true for him/her*, and "YES!" meant *definitely true for him/her*.

Community Injunctive Norms Regarding Substance Use

This scale on the AYS contains three items that ask adolescents to rate their perception of the level of their neighbors' disapproval if he/she were to use a particular drug. A full list of the three community injunctive norms regarding substance use items for this variable can be found in the Appendix. The following is an example of one of the questions used in this scale: "How wrong would most adults in your neighborhood think it was for kids your age to smoke marijuana?" The possible responses for this question are: very wrong, wrong, a little bit wrong, and not wrong at all.

CHAPTER III

RESULTS

Overview of the Analyses

The research questions for the current study were analyzed utilizing a generalized linear mixed model (GLMM) that accounts for dependent variables that are not normally distributed. This statistical model was selected due to the nature of the research questions as well as the nature of the data that were utilized in this research study. A GLMM design was chosen in part to account for the hierarchical nature of the AYS data. Given that the survey data used for this study were collected across multiple schools, it was determined that data analyses would need to take into account the shared variance resulting from participants (level 1) being nested within schools (level 2), which can result in an increased likelihood that students within a school will be more similar to each other than students from another school. In addition, GLMMs are able to include fixed effects that contribute to variability that is not explained by correlations associated with nested data (Zhu, 2014). Within GLMMs, the variance associated with nested variables is often referred to as random effects, whereas variance that is attributed to other variables in the analysis is often referred to as fixed effects (Zhu, 2014). Utilizing analytical methods to account for both forms of variance provides greater understanding as to how factors are associated with dependent variables, which, in this case, is

adolescent drug use.

Within each of the analyses, students (level 1) were nested within schools (level 2), and the initial dependent variable for the each of the research questions was adolescents' past 30-day drug use of the following four drug types: cigarettes, alcohol, marijuana, and prescription drugs. A number of differences between use rates and correlations were found between the drugs that were used to construct the adolescent 30-day drug use variable. After examining the items, it was determined that the first dependent variable (AMC use) would be the total score resulting from the adolescents' reported use of the three most frequently used drugs, which are alcohol, cigarettes, and marijuana. It was also determined that additional analyses would be conducted utilizing the 30-day PD abuse variable as a separate dependent variable to determine what, if any, significant differences and similarities would be found between the results from separate analyses of these two dependent variables.

The PROC GLIMMIX procedure in the Statistical Analysis Software (SAS) version 9.4 statistical software program was utilized for data analyses. This procedure utilizes GLMM analyses that account for random effects resulting from the nested nature of the data as well as possible fixed effects resulting from predictor variables. In addition, the PROC GLIMMIX procedure is able to accurately analyze data that have zero-inflated dependent variables. Zero-inflated dependent variables are outcome variables that measure behaviors or other occurrences that are relatively infrequent, which results in an inflated number of zeros. The dependent variables included in this study were both found to have positively skewed distributions with inflated numbers of zeros.

Many forms of statistical analyses make the assumption that dependent variables are normally distributed, which, in turn, requires that data that are analyzed utilizing these methods fall within a normal distribution (Heck, Thomas, & Tabata, 2010; Leech, Barrett, & Morgan, 2008). An analysis of the data distributions of each variable within this study indicated that the dependent variables, AMC use and adolescent PD abuse, were significantly positively skewed within each of the three AYS administrations. Due to the skewed nature of these variable distributions, utilizing analyses that require normally distributed dependent variables to analyze these datasets would have produced biased estimates that nullified the results of the analyses (Heck et al., 2010). Substance abuse researchers often encounter skewed datasets due in part to the relatively low rates of use when analyzing general populations, which was the case with this dataset. Several researchers have utilized data transformations to correct for skewed data (Botvin et al., 2000; Dishion & Owen, 2002; Parsai, Marsiglia, & Kulis, 2010), although significant problems associated with these transformations have led to recommendations that other analytical methods be used (Coxe, West, & Aiken, 2009).

One common recommendation is to utilize analytical methods that are designed to analyze data with Poisson distributions (Atkins & Gallop, 2007; Coxe et al., 2009). A Poisson distribution is a distribution of count data that is significantly positively skewed (Anderson, 2002). Given that the dependent variable of adolescent drug use is essentially a count of the number of times the adolescent reported using drugs within the past 30 days prior to the survey administration date, and that the resulting datasets were significantly skewed due to relatively low reported use, it was determined that the dependent variables were Poisson distributions and that analyses would utilize a Poisson

distribution.

Within a Poisson distribution, μ is the parameter that represents both the mean and the variation of the distribution (Coxe et al., 2009). Coxe et al. (2009) note that a Poisson model assumes that the variance and the conditional mean are equal, which is a known as equidispersion, while overdispersion occurs when the distribution of data has too much variability. They also noted that if overdispersion is not accounted for standard errors will likely be too small and estimates of significance will be inflated. Within each of the GLMM analyses a generalized chi-square score was calculated in order to ensure that the data distributions were equidispersed and did not exhibit overdispersion (Isik, 2011). The resulting generalized chi-square score divided by the degrees of freedom provides an estimate that can be used to determine if a distribution is exhibiting signs of overdispersion. If the resulting score is greater than one, overdispersion is likely present (Isik, 2011). In each of the GLMM analyses the calculated generalized chi-square/DF scores were less than one, indicating that no evidence of overdispersion was found within any of the distributions.

After screening the data utilizing Statistical Package for the Social Sciences (SPSS) statistical software, GLMM analyses were conducted utilizing the PROC GLIMMIX procedure in SAS. The following section provides information regarding the data screening procedures. The data screening procedures section will then be followed by a description of the PROC GLIMMIX analytical procedures as well as a description of the results.

Data Screening

Data were examined for accuracy and to ensure that necessary assumptions were met based upon the analytical methods that were used (Heck et al., 2010; Leech et al., 2008). Data consisted of survey results from the 2012 administrations of the AYS. Results from all AYS participants who self-identified as Hispanic or Latino were initially included in the analyses. As noted in the Methodology section, listwise deletion was used to remove cases that were identified as invalid through validity screeners or contained missing data on the variables included in the analyses. More detailed information regarding the AYS measure, administration procedures, data screening, and the participants that were included in the analyses can be found in the Methodology section. One of the main problems associated with listwise deletion is a loss of power; however, the large number of subjects and schools in this study likely compensated for any loss of power that resulted from deletions of cases. The final AYS 2012 dataset utilized 14,273 participants, of which 6,914 were 8th-graders, 4,108 were 10th-graders, and 3,251 were 12th-graders.

Descriptive Statistics

Study participants consisted of eighth, tenth, and twelfth grade students in the state of Arizona who completed the 2012 AYS and self-identified as Hispanic or Latino. The final dataset from the 2012 AYS consisted of results from 14,273 participants, 46.4% male and 53.6% female, within a total of 260 schools. Additional demographic information is included in Table 2. Information regarding variable means, standard deviations, and score ranges can be found in Table 4.

Table 4

Variable Means, Standard Deviations, and Score Ranges

Variable	Mean	Standard Deviation	Score Range
Adolescent Marijuana, Alcohol, and Cigarette Use (AMC use)	4.32	2.64	3-21
Adolescent Prescription Drug Abuse (PD use)	3.20	.94	3-21
Friends' Drug Use	8.44	4.27	4-20
Parental Attachment	19.94	5.30	7-28
Parental Injunctive Norms	3.97	1.70	3-12
Parental Injunctive Norms Regarding Prescription Abuse	1.21	.59	1-4
Community Attachment	16.20	4.90	7-28
Community Injunctive Norms	5.10	2.42	3-12
Home Language (Dichotomous)	.34	.48	0-1
Gender (Dichotomous)	1.54	.50	1-2
Family Education Level	1.76	1.48	0-4

GLMM Analyses

The PROC GLIMMIX procedure was used to assess the relationships between the two adolescent drug use dependent variables, and the five predictor variables: friends' drug use, parental attachment, parental injunctive norms, community attachment, and community injunctive norms. Separate GLMM analyses were conducted with past 30 day AMC use as a dependent variable, then separate analyses were conducted utilizing past 30-day prescription drug abuse as a dependent variable.

As was noted previously, Table 4 provides information regarding the means, standard deviations, and score ranges of the dependent variables and all other variables included in the analyses. In addition, Table 5 provides information to assist in understanding and interpreting scores for each of the variables. For additional information regarding the specific items found within each of the scales, please refer to

Table 5

Variable Score Ranges and Descriptions

Variable	Score Range	Grand Mean Centered	Description
Dependent Variables			
Adolescent AMC Use Within Previous 30 Days	3-21	No	3 = No reported use…21 = High reported use
Adolescent PD Abuse Within Previous 30 Days	3-21	No	3 = No reported use…21 = High reported use
Independent Variables			
Home Language (Dichotomous)	0-1	No	0 = English; 1 = Spanish
Gender (Dichotomous)	1-2	No	1 = Male; 2 = Female
Family Education Level	0-3	Yes	0 = Less than a high school diploma 1 = High school diploma or GED; 2 = Some college, community/tech, or a 4 year degree; 3 = Graduate or professional degree;
Friends' Drug Use	4-20	Yes	4 = None of the participant's 4 best friends have used any drugs in the four categories within the past year…20 = Four of the participant's 4 best friends have used drugs in all four categories within the past year
Parental Attachment	7-28	Yes	7 = Low parental attachment…28 = High parental attachment
Parental Injunctive Norms	3-12	Yes	3 = Low parental disapproval of drug use…12 = High parental disapproval of drug use
Parental Injunctive Norms Regarding Prescription Abuse	1-4	Yes	1 = Low parental disapproval of prescription drug abuse…4 = High parental disapproval of prescription drug abuse;
Community Attachment	7-28	Yes	7 = Low Community Attachment…28 = High Community Attachment
Community Injunctive Norms	3-12	Yes	3 = Low community approval of drug use…12 = High community approval of drug use

the Appendix.

It is important to note that the PROC GLIMMIX procedure utilizes a logarithmic transformation, which changes the metric of the variables and makes interpretation of the results difficult (Coxe et al., 2009). In order to correct this, some statisticians have recommended that researchers exponentiate coefficients, which is the inverse of a logarithmic transformation (Atkins & Gallop, 2007). Exponentiation utilizes *e* (which is approximately 2.718) as the base and the resulting coefficient as the exponent. For example, the initial model that utilized adolescent AMC use as the outcome variable produced a gender regression coefficient of -0.040, which was exponentiated ($2.718^{-.040}$ = .961) in order to reverse the logarithmic transformation that occurred through the PROX GLIMMIX procedure. All of the regression coefficients from each analysis were exponentiated, which converts the logarithmically transformed regression coefficients back into their original metrics, thus simplifying interpretation of results (Coxe et al., 2009). All of the results tables contain the original regression coefficient estimate as well as the exponentiated regression coefficient.

An initial analysis was conducted with AMC use as the dependent variable. All predictor variables as well as friends' use interactions with the parental and community predictor variables were included in the model, with students nested within schools being the random effect that was tested within the analysis. An additional analysis was then conducted with all predictor variables that were statistically significant, interactions between friends' drug use and statistically significant parental and community predictor variables, and three-way interactions between friends' drug use, parental and community predictor variables, and grade level. The same analyses were then conducted utilizing PD

abuse as the dependent variable. An initial analysis was conducted with adolescent PD abuse as the dependent variable and all predictor variables as well as friends' use interactions with the parental and community predictor variables included in the model, with students nested within schools being the random effect that was tested. A second PD abuse model analysis was then conducted with all predictor variables that were statistically significant as well as interactions between friends' drug use and parental and community variables, with PD abuse as the dependent variable, and once again, with three-way interactions between friends' drug use, parental and community predictor variables, and grade level. The PD abuse analyses included a parental injunctive norms regarding prescription drug abuse variable, which was not in the AMC use models. The parental injunctive norms regarding PD abuse variable is discussed in more detail within the analysis section.

One important finding consistent across all analyses was that no statistically significant random effects were found. Within the PROC GLIMMIX procedure, the test of random effects is the estimated G matrix (Kiernan, Tao, & Gibbs, 2012). Each of the analyses produced a result that stated the following: "Estimated G matrix is not positive definite." These results indicated that the random effects, which consisted of the nesting of students (level 1) within school (level 2), were estimated to be zero (Kiernan, et al., 2012). Stated simply, results indicated that no statistically significant variance in the dependent variables (adolescent AMC use and PD abuse) was found to be explained through the grouping structure of schools. Kiernan et al. (2012) note that some statisticians recommend removing the random effect from the model when this result occurs, while other statisticians argue that the random effect is essential to the design

structure. Kiernan et al. (2012) recommend leaving the random effect in the model due to it being a part of the design and data collection, and due to the fact that PROC GLIMMIX procedure will produce the same result with or without the zeroed term in the model. Based upon this recommendation, each of the models included the random effect of students nested within schools.

The PROC GLIMMIX analyses and subsequent results will be presented starting with two models that used AMC use as the dependent variable, then two models that used PD abuse as the dependent variable. Each initial model included all variables and two-way interactions. The second models included statistically significant variables from the initial model as well as two-way and three-way interactions. An interpretation and comparison of the results as they relate to the research questions will then follow.

The exponentiated intercept represents the reported drug use when all other predictors are zero (Coxe et al., 2009). The exponentiated predictor variable coefficients that are reported for all analyses are multiplicative, meaning that the resulting number represents the predicted multiplicative change in the exponentiated intercept for a 1-unit change in the predictor variable (Coxe et al., 2009). An exponentiated variable coefficient of one indicates that no change was found, while exponentiated variable coefficients that are greater than one are associated with an increase in reported substance use within the past 30 days, while exponentiated variable coefficients that are less than one are associated with a decrease in reported substance use within the past 30 days. For example, with an exponentiated intercept of 5.125, if a regression coefficient for a predictor variable is 1.20, the predictor variable is associated with a predicted change in the intercept from 5.125 to 6.150 for every 1-unit increase in the predictor variable,

indicating that the predictor variable is associated with an increased risk of use. Utilizing the same intercept above, if a resulting regression coefficient for a variable is 0.80, the predictor variable is associated with a decrease in the intercept from 5.125 to 4.100 for every 1-unit increase in the predictor variable, indicating that the predictor variable is associated with decreased risk of reported drug use. Greater magnitudes indicate greater changes, so a regression coefficient of .95 would be associated with a larger magnitude change than a regression coefficient of .97 since .97 is associated with a .03 change, whereas .95 is associated with a .05 change. In addition, a regression coefficient of 1.07 would also be associated with a larger multiplicative change than a regression coefficient of 1.05.

AMC Use Models

Results from the initial AMC use model that included all predictor variables and interactions between friends' use and community and parent predictor variables can be found in Table 6. The resulting exponentiated intercept of 6.071 represents the reported drug use when all other predictors are zero (Coxe et al., 2009). This number falls within a scale of 3 to 21 (see Table 5 and Appendix A for more information on this and other variables), with a "3" being no reported AMC use in the previous 30 days and "21" indicating highly frequent use of AMC within the previous 30 days. Results indicate that the gender, grade level, friends' use, parental attachment, parental injunctive norms, and community injunctive norms predictor variables were all statistically significant at the $\leq .001$ level. The home language variable was significant at the $\leq .05$ level, whereas the family education and community attachment variables were not statistically significant.

Table 6

AYS PROC GLIMMIX Procedure Results With All Variables and Friends' Use Interactions With AMC Use as the Dependent Variable.

Variables	Regression Coefficient	Standard Error of Regression Coefficient	Exponentiated Regression Coefficient	p
Intercept	1.804	0.0500	6.071	**≤.001**
Gender	-0.040	0.0082	0.961	**≤.001**
Grade	0.025	0.0027	1.025	**≤.001**
Home Language	-0.027	0.0087	0.973	0.002*
Family Education Level	-0.004	0.0028	0.996	0.194
Friends' Use	0.090	0.0062	1.094	**≤.001**
Parental Attachment	-0.007	0.0008	0.993	**≤.001**
Parental Injunctive Norms	-0.043	0.0029	0.958	**≤.001**
Community Attachment	0.001	0.0009	1.001	0.264
Community Injunctive Norms	0.013	0.0020	1.013	**≤.001**
Friends' Use X Parental Attachment	-0.001	0.0002	0.999	**≤.001**
Friends' Use X Parental Injunctive Norms	-0.003	0.0005	0.997	**≤.001**
Friends' Use X Community Attachment	0.0003	0.0002	1.000	0.068
Friends' Use X Community Injunctive Norms	0.001	0.0004	1.001	0.004*

*Significant at the ≤.05 level; ****Significant at the ≤.001 level**

was subtracted from each respondent's scores on this variable. This was done to facilitate interpretation of results as they relate to the average amount of friends' use reported by the total sample. The friends' use exponentiated coefficient of 1.094 is interpreted as the predicted multiplicative change in reported AMC use with a 1-unit increase above the mean in reported friends' use with all other variables held at zero. A 1-unit increase on the friends' use variable means that one of four best friends was

reported to have used one type of drug at least once within the last year. The resulting 1.094 coefficient means that an increase of one unit on the friends' use variable above the friends' use grand mean is associated with a multiplicative increase in the exponentiated intercept by 1.094. More specifically, with all other variables in the model held at zero, an increase of one friend's use of one drug within the prior year above the grand mean was associated with an increase in the predicted AMC use from 6.071 to 6.642 (6.071 multiplied by 1.094). Thus, a 1-unit increase in the friends' use predictor variable above mean friends' use was associated with a predicted mean AMC use increase of 0.57. This result is consistent with prior research findings that have found a strong positive relationship between adolescent drug use and peer substance use (Cleveland et al., 2008; Ennett et al. 2006; Galea et al., 2004; Olds & Thombs, 2001; Steinberg et al., 1994; Windle, 2000).

The gender variable was a dichotomous variable with male and female as possible responses. The resulting gender exponentiated coefficient of 0.961 indicates that, with all other variables in the model held at zero, being a female Hispanic adolescent rather than male was associated with a decrease in predicted AMC use from 6.071 to 5.834 (6.071 multiplied by 0.961). Thus, being a Hispanic female was associated with a predicted mean decrease of 0.237 on the AMC use scale. The grade variable consisted of 8^{th}- 10^{th}- and 12^{th}-grades. The grade exponentiated coefficient of 1.025 indicates that a two grade increase was associated with an increase in predicted AMC use from 6.071 to 6.222. This result indicates that an increase of two grade levels (e.g., 10^{th}-grade versus 8^{th}-grade) was associated with a predicted mean increase of 0.152 on the AMC use scale. The home language variable was a dichotomous variable that included English and Spanish as

possible responses. The resulting home language exponentiated coefficient of 0.973 indicates that, with all other variables in the model held at zero, use of Spanish as the predominant language spoken at home was associated with a decrease in predicted AMC use from 6.071 to 5.907. Thus, living in a home where Spanish is the predominant spoken language was associated with a predicted mean decrease of 0.164 on the AMC use scale.

The parental attachment variable measured levels of parental attachment reported by respondents, with lower scores indicating lower levels of attachment and higher scores indicated higher levels of attachment. This variable was also grand mean centered. The resulting exponentiated coefficient of 0.993 indicates that, with all other variables in the model held at zero, an increase of one unit on the parental attachment scale above the grand mean was associated with a decrease in predicted AMC use from 6.071 to 6.029. Consequently, a 1-unit increase in the parental attachment predictor variable above the grand mean was associated with a predicted mean AMC use decrease of 0.043.

The parental injunctive norms variable sought to measure levels of parental disapproval of their adolescent children's drug use as reported by respondents, with lower scores indicating lower levels of disapproval and higher scores indicated higher levels of disapproval. This variable was also grand mean centered. The resulting exponentiated coefficient of 0.958 indicates that, with all other variables in the model held at zero, an increase of 1-unit on the parental injunctive norms scale above the grand mean was associated with a decrease in predicted AMC use from 6.071 to 5.816. Consequently, a 1-unit increase in the parental injunctive norms predictor variable above the grand mean was associated with a predicted mean AMC use decrease of 0.255.

The community injunctive norms variable was used to measure levels of community disapproval of adolescent drug use as reported by respondents, with lower scores indicating lower levels of disapproval and higher scores indicated higher levels of disapproval. This variable was also grand mean centered. The resulting exponentiated coefficient of 1.013 indicates that, with all other variables in the model held at zero, an increase of 1- unit on the community injunctive norms scale above the grand mean was associated with an increase in predicted AMC use from 6.071 to 6.150. Consequently, a 1-unit increase in the community injunctive norms predictor variable above the grand mean was associated with a predicted mean AMC use increase of 0.079.

As was noted earlier, the exponentiated predictor variable coefficients are interpreted as an average multiplicative change in adolescent AMC use for a 1-unit change in the predictor variable when all other predictor variables are held at zero. This results in problems with the interpretation of exponentiated interaction coefficients (Coxe et al., 2009). In order to facilitate the interpretation of these interactions, Coxe et al. (2009) recommend plotting the predicted trends of each group at different values of the predictor variable. In order to plot and interpret the interactions, each of the predictor variables was dichotomized into low and high groups, with the low groups falling below the variable group mean and the high groups falling above the variable group mean. A separate analysis was then conducted to calculate least squared means for each group. A plot utilizing the least squared means was produced for each of the statistically significant interactions.

The interactions between friends' use and parental attachment as well as friends' use and parental injunctive norms were both statistically significant at the $\leq .001$ level.

The interaction between friends' use and community injunctive norms was statistically significant at the ≤.05 level. These interactions provide information regarding possible moderating effects associated with the parent and community predictor variables.

The resulting plot of the interaction between friends' use and parental attachment (see Figure 1) indicates that individuals with high levels of reported friends' use and low levels of parental attachment had a higher estimated mean AMC use than students with high levels of reported friends' use and high parental attachment. This pattern was also present with low levels of reported friends' use and low and high levels of parental attachment, although the differences between the low and high parental attachment groups were smaller in magnitude for the low friends' use groups than they were for the high friends' use groups. This difference indicates that the moderating effect associated

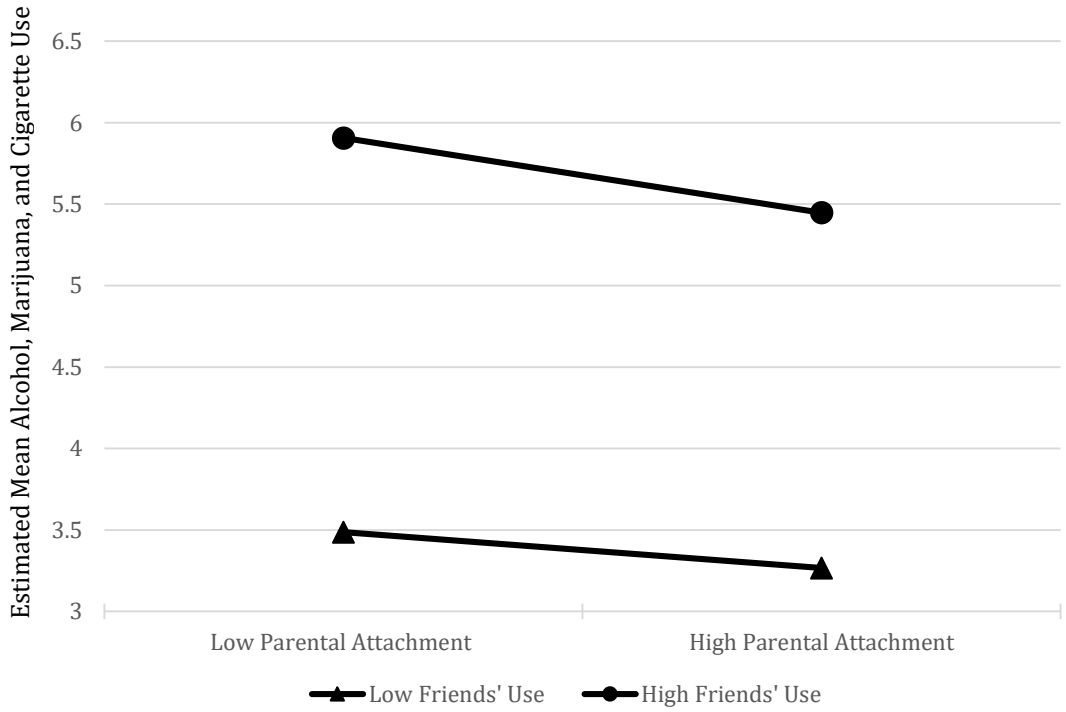

Figure 1. Plot of the Parental Attachment Moderator With AMC Use as the Dependent Variable.

with higher levels of parental attachment appears to be slightly stronger for participants who reported high levels of friends' use than for those who reported low levels of friends' use. Overall, high parental attachment did moderate the relationship between friends' use and Hispanic adolescent AMC use, with stronger moderation occurring with students who reported a greater amount of friends' use.

The plot of the interaction between friends' use and parental injunctive norms (see Figure 2) indicates that individuals with high levels of reported friends' use and low levels of parental injunctive norms had a higher estimated mean AMC use than students with high levels of reported friends' use and high parental injunctive norms. The same pattern was present with low levels of reported friends' use and low and high levels of

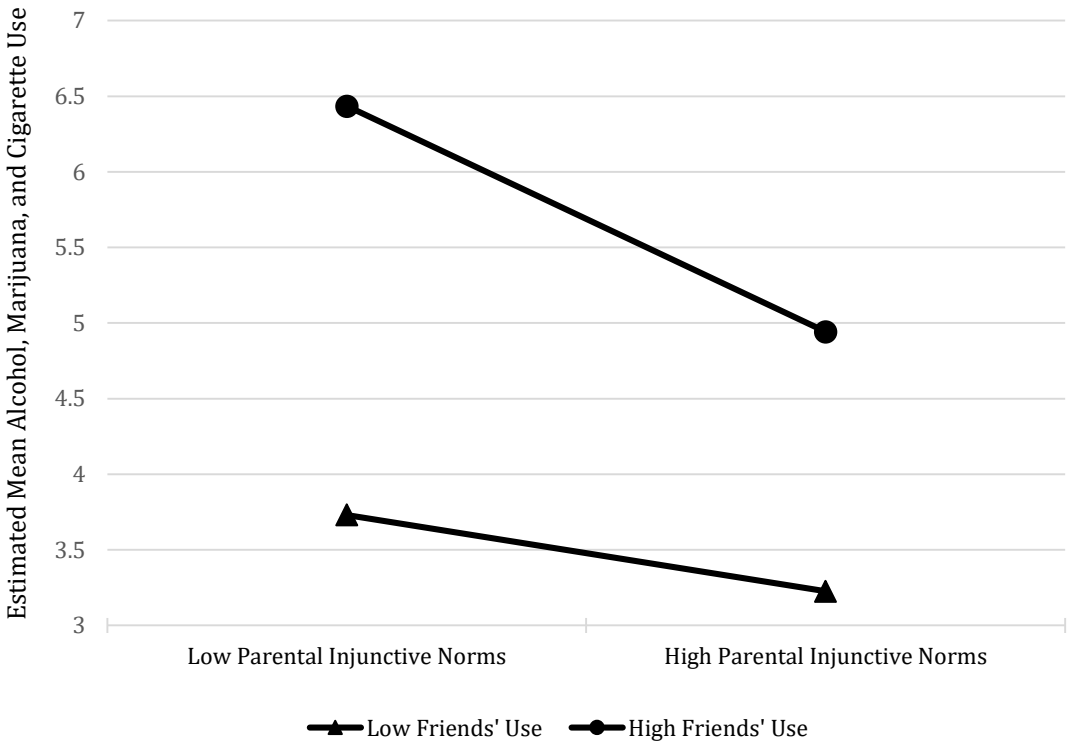

Figure 2. Plot of the Parental Injunctive Norms Moderator With AMC Use as the Dependent Variable.

parental injunctive norms, although the differences between the low and high parental injunctive norms groups were smaller in magnitude for the low friends' use groups than they were for the high friends' use groups. This difference indicates that the moderating effect associated with higher levels of parental injunctive norms appears to be stronger for participants who reported high levels of friends' use than for those who reported low levels of friends' use. Overall, high parental injunctive norms moderated the relationship between friends' use and Hispanic adolescent AMC use, with stronger moderation occurring with students who reported a greater amount of friends' use.

The resulting plot of the interaction between friends' use and community injunctive norms (see Figure 3) indicates that respondents with high levels of reported

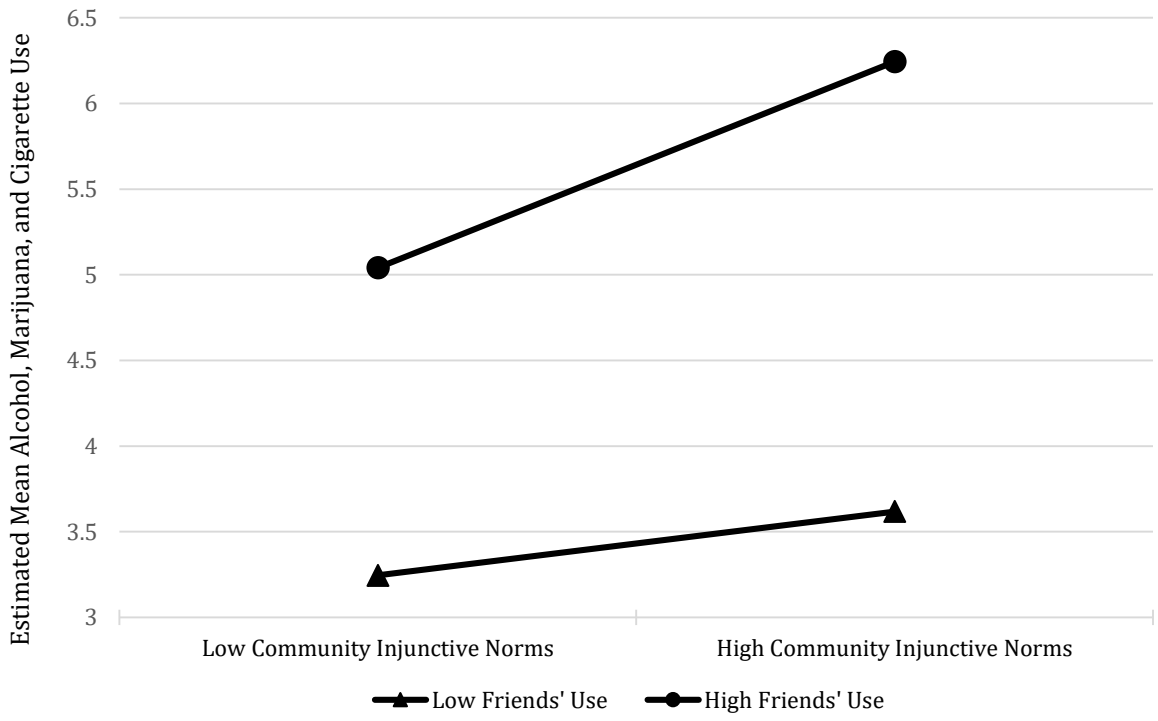

Figure 3. Plot of the Community Injunctive Norms Moderator with AMC Use as the Dependent Variable

friends' use and high levels of community injunctive norms had a higher estimated mean AMC use than students with high levels of reported friends' use and low community injunctive norms. This pattern was also present with low levels of reported friends' use and low and high levels of community injunctive norms, although the differences between the low and high parental attachment groups were smaller in magnitude for the low friends' use groups than they were for the high friends' use groups. This difference indicates that a moderating effect associated with higher levels of community injunctive norms was not found, rather, the opposite effect was found. Results indicate that higher levels of community injunctive norms increased the estimated mean AMC use. This relationship appears to be more pronounced for participants who reported higher levels of friends' use. Overall, high community injunctive norms did not moderate the relationship between friends' use and Hispanic adolescent AMC use, and was instead associated with increased AMC use, particularly by participants who reported higher levels of friends' use. Although these results seem somewhat counterintuitive, one possible explanation may be that the community injunctive norms variable construct could be flawed. Further explanations will follow in the discussion section.

A second AMC use model was conducted in order to explore a more parsimonious model as well as to explore possible differences between grade levels. This second AMC use model included predictor variables that were statistically significant from the initial model as well as the following: two-way interactions between the friends' use variable and statistically significant parent and community variables, and three-way interactions between the friends' use variable, statistically significant parent and community variables, and grade level. Results from this model can be found in Table 7.

Table 7

AYS PROC GLIMMIX Procedure Results With Statistically Significant Variables, Friends' Use Interactions, and Grade-Level Interactions With AMC Use as the Dependent Variable.

Variables	Regression Coefficient	Standard Error of Regression Coefficient	Exponentiated Regression Coefficient	p
Intercept	1.836	0.05119	6.273	**≤.001****
Gender	-0.039	0.00815	0.962	**≤.001****
Grade	0.022	0.00283	1.022	**≤.001****
Home Language	-0.026	0.00867	0.974	0.003*
Friends' Use	0.086	0.00624	1.090	**≤.001****
Parental Attachment	-0.007	0.00083	0.993	**≤.001****
Parental Injunctive Norms	-0.045	0.00293	0.956	**≤.001****
Community Injunctive Norms	0.014	0.00202	1.014	**≤.001****
Friends' Use X Parental Attachment	-0.003	0.00096	0.998	0.009*
Friends' Use X Parental Injunctive Norms	-0.006	0.00063	0.994	**≤.001****
Friends' Use X Community Injunctive Norms	0.004	0.00183	1.004	0.036*
Friends' Use X Parental Attachment X Grade	0.0002	0.00010	1.000	0.051
Friends' Use X Parental Injunctive Norms X Grade	0.0003	0.00005	1.0003	**≤.001****
Friends' Use X Community Injunctive Norms X Grade	-0.0003	0.00018	1.000	0.082

*Significant at the ≤.05 level; ****Significant at the ≤.001 level**

As was the case with the initial AMC use model, the second AMC use model's exponentiated intercept, which was 6.273, represents the estimated reported drug use when all other predictors are zero (Coxe et al., 2009). Results indicate that the gender, grade level, friends' use, parental attachment, parental injunctive norms, and community injunctive norms predictor variables were all statistically significant at the ≤.001 level. The home language variable was significant at the ≤.05 level. The two-way interactions between friends' use and parental attachment and friends' use and community injunctive

norms were both statistically significant at the ≤.05 level. The three-way interaction between friends' use, parental attachment, and grade level was also statistically significant at the ≤.05 level. The parental attachment and community injunctive norms three-way interactions were not statistically significant.

The resulting gender exponentiated coefficient of 0.962 indicates that, with all other variables in the model held at zero, being a female Hispanic adolescent was associated with a decrease in predicted AMC use from 6.273 to 6.035. Thus, being a Hispanic female was associated with predicted mean decrease of 0.238 on the AMC use scale. The grade exponentiated coefficient of 1.022 indicates that a two-grade increase was associated with an increase in the predicted AMC use from 6.273 to 6.411. This result indicates that an increase of two grade levels (e.g., from 8th-grade to 10th-grade) was associated with predicted mean increase of 0.138 on the AMC use scale. The resulting home language exponentiated coefficient of 0.974 indicates that, with all other variables in the model held at zero, use of Spanish as the predominant language spoken at home was associated with a decrease in predicted AMC use from 6.273 to 6.110. Thus, living in a home where Spanish is the predominant spoken language was associated with a predicted mean decrease of 0.163 on the AMC use scale.

The friends' use exponentiated coefficient was 1.090, which was associated with an increase in the predicted AMC use from 6.273 to 6.838. Thus, a 1-unit increase in the friends' use predictor variable above mean friends' use was associated with a predicted mean AMC use increase of 0.565. The parental attachment exponentiated coefficient of 0.993 indicates that, with all other variables in the model held at zero, an increase of one unit on the parental attachment scale above the grand mean was associated with a

decrease in predicted AMC use from 6.273 to 6.229. Consequently, a 1-unit increase in the parental attachment predictor variable above the grand mean was associated with a predicted mean AMC use decrease of 0.044. The parental injunctive norms exponentiated coefficient of 0.956 was associated with a decrease in predicted AMC use from 6.273 to 5.997. Consequently, a 1-unit increase in the parental injunctive norms predictor variable above the grand mean was associated with a predicted mean AMC use decrease of 0.276. The community injunctive norms exponentiated coefficient of 1.014 was associated with an increase in predicted AMC use from 6.273 to 6.361. Consequently, a 1-unit increase in the community injunctive norms predictor variable above the grand mean was associated with a predicted mean AMC use increase of 0.088.

The plots reported in the first AMC use model (Figures 1-3) also facilitate the interpretation of the two-way interaction results from the second AMC use model. Results from the second AMC use model indicate that a statistically significant moderating effect was found between parental attachment and friends' use as well as between parental injunctive norms and friends' use. A significant effect was found for the friends' use and community injunctive norms interaction, indicating that higher levels of reported community injunctive norms were associated with increased risk of use.

The same methods that were used to interpret the two-way interactions were also utilized to plot and interpret the three-way interaction between grade level, parental injunctive norms, and friends' use in the second model. This process consisted of dichotomizing predictor variables into low and high groups, with the low groups falling below the variable group mean and the high groups falling above the variable group mean. A separate analysis was then conducted to calculate least squared means for each

group. A plot utilizing the least squared means was then produced.

The resulting plots of the interaction between friends' use, parental injunctive norms, and grade level from the second AMC use model (see Figure 4) indicate that individuals across grade levels with high levels of reported friends' use and low levels of parental injunctive norms had a higher estimated mean AMC use than students with high levels of reported friends' use and high parental injunctive norms. This pattern was also present with low levels of reported friends' use and low and high levels of parental injunctive norms, although the differences between the low and high parental injunctive norms groups were smaller in magnitude for the low friends' use groups than they were for the high friends' use groups. This difference indicates that the moderating effect associated with higher levels of parental injunctive norms appears to be slightly stronger for participants who reported high levels of friends' use than for those who reported low levels of friends' use. Plots also indicate that 10th-and 12th-graders who reported high levels of friends' use experienced a slightly greater difference between the low and high parental injunctive norms groups than 8th-graders. This result indicates that the protective effect associated with parental injunctive norms appears to be somewhat stronger for 10th- and 12th-grade Hispanic adolescents than it is for 8th-grade Hispanic adolescents. Overall, results from the second AMC use model indicate that high parental injunctive norms continued to moderate the relationship between friends' use and Hispanic adolescent AMC use, with stronger moderation occurring with students who reported a greater amount of friends' use as well as students in the 10th- and 12th-grades.

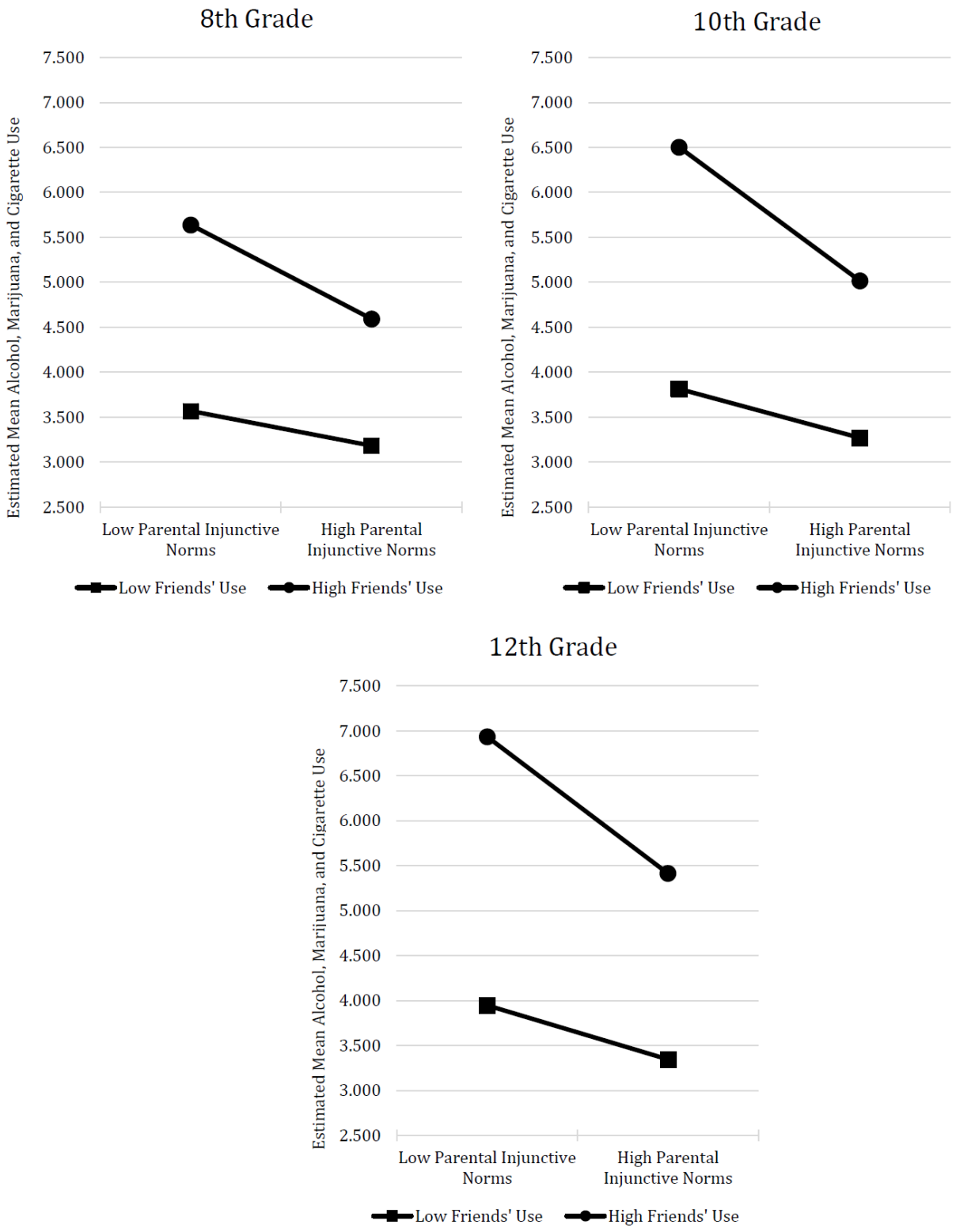

Figure 4. Plots of the Friends' Use, Parental Attachment, and Grade Level 3-way Interaction With AMC Use as the Dependent Variable.

PD Abuse Models

Results from the initial PD abuse model that included all predictor variables and interactions between friends' use and community and parent predictor variables can be found in Table 8. One important difference between the AMC use models and the PD abuse models was that both of the PD abuse models included the parental injunctive norms regarding PD abuse predictor variable, which was not included in the AMC use models. This variable was included in the PD abuse models due in part to a lack of inclusion of prescription drugs in the parental injunctive norms variable items. As can be seen in the Appendix, the parental injunctive norms variable measures respondents' reported perception of parental disapproval of their use of cigarettes, alcohol, and marijuana. It was also hypothesized that adolescents and parents may have a greater lack of understanding of the risks associated with adolescent PD abuse than with AMC use. With this, one might predict that explicit communication of disapproval from parents would be less prevalent than with other drugs. Both the parental injunctive norms variable and the parental injunctive norms regarding PD abuse variable were included in the PD abuse models to provide additional information on possible differences and to ensure that a direct measure of perceived parental disapproval of PD abuse was included in the PD abuse models.

The resulting exponentiated intercept of 4.004 represents the reported drug use when all other predictors are zero (Coxe et al., 2009). This number falls within a scale of 3 to 21 (see Table 5 and Appendix A for more information on this and other variables), with a "3" being no reported PD abuse in the previous 30 days and "21" indicating highly frequent PD abuse within the previous 30 days. Results indicate that the friends'

Table 8

AYS PROC GLIMMIX Procedure Results With All Variables and Friends' Use Interactions With Adolescent PD Abuse as the Dependent Variable.

Variables	Regression Coefficient	Standard Error of Regression Coefficient	Exponentiated Regression Coefficient	P
Intercept	1.387	0.0640	4.004	**≤.001****
Gender	0.007	0.0095	1.007	0.439
Grade	-0.002	0.0031	0.998	0.557
Home Language	-0.011	0.0100	0.989	0.272
Family Education Level	-0.001	0.0033	0.999	0.854
Friends' Use	0.040	0.0100	1.041	**≤.001****
Parental Attachment	-0.002	0.0009	0.998	0.010*
Parental Injunctive Norms	0.006	0.0038	1.006	0.102
Parental Injunctive Norms Regarding Prescription Abuse	-0.061	0.0091	0.941	**≤.001****
Community Attachment	-0.001	0.0010	0.999	0.210
Community Injunctive Norms	0.003	0.0023	1.003	0.168
Friends' Use X Parental Attachment	-0.0005	0.0002	0.9995	0.018*
Friends' Use X Parental Injunctive Norms	-0.002	0.0007	0.998	0.029*
Friends' Use X Parental Injunctive Norms Regarding Prescription Abuse	-0.002	0.0019	0.998	0.354
Friends' Use X Community Attachment	-0.0002	0.0002	1.000	0.335
Friends' Use X Community Injunctive Norms	0.0003	0.0005	1.000	0.464

*Significant at the ≤.05 level; ****Significant at the ≤.001 level**

use and parental injunctive norms regarding PD abuse predictor variables were statistically significant at the ≤.001 level. The parental attachment variable was significant at the ≤.05 level, whereas all other single variables were not statistically significant. Only two of the five interaction variables were statistically significant in this model. The interactions between friends' use and parental attachment as well as friends'

use and parental injunctive norms were both statistically significant at the ≤.05 level, whereas the other interactions were not statistically significant.

The friends' use predictor variable produced an exponentiated coefficient of 1.041. This indicates that, with all other variables in the model held at zero, an increase of one friends' use of one drug within the prior year above the grand mean was associated with an increase in the predicted PD abuse from 4.004 to 4.168. Thus, a 1-unit increase in the friends' use predictor variable above mean friends' use was associated with a predicted mean PD abuse increase of 0.164. This result is consistent with results from the initial AMC use model, although the magnitude of change associated with friends' use was smaller for PD abuse, indicating that friends' use may be less predictive of Hispanic adolescent PD abuse than Hispanic adolescent AMC use.

The parental attachment variable produced an exponentiated coefficient of 0.998, which indicates that, with all other variables in the model held at zero, an increase of 1-unit on the parental attachment scale above the grand mean was associated with a decrease in predicted PD abuse from 4.004 to 3.996. Consequently, a 1-unit increase in the parental attachment predictor variable above the grand mean was associated with a predicted mean PD abuse decrease of 0.008.

The exponentiated coefficient for the parental injunctive norms regarding PD abuse predictor variable was 0.941, indicating that, with all other variables in the model held at zero, an increase of 1-unit on the parental injunctive norms regarding PD abuse scale above the grand mean was associated with a decrease in predicted AMC use from 4.004 to 3.768. Consequently, a 1-unit increase in the parental injunctive norms predictor variable above the grand mean was associated with a predicted mean AMC use decrease

of 0.236. This indicates that respondents who reported greater parental disapproval of adolescent PD abuse on average were less likely to report use within the previous 30 days than respondents who reported lower parental disapproval. This result is consistent with prior research findings (Elek et al., 2006) as well as results from the AMC use models when compared to the general parental injunctive norms variable; however, the general parental injunctive norms variable was not significant in the PD abuse model. These results indicate that specific parental disapproval of PD abuse is likely to be more effective in reducing the risk of Hispanic adolescent PD abuse than general parental disapproval of substance use.

The resulting plot of the interaction between friends' use and parental attachment with PD abuse as the dependent variable (see Figure 5) indicates that individuals with

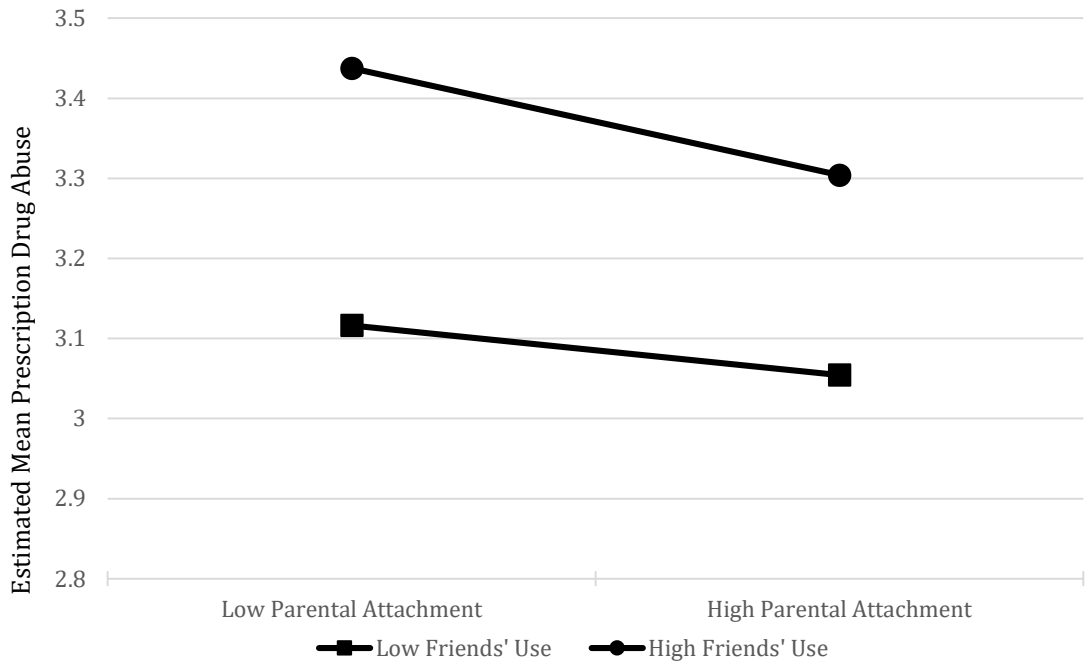

Figure 5. Plot of the Parental Attachment Moderator With PD Abuse as the Dependent Variable.

high levels of reported friends' use and low levels of parental attachment had higher estimated mean PD abuse than students with high levels of reported friends' use and high parental attachment. This pattern was also present with low levels of reported friends' use and low and high levels of parental attachment, although the differences between the low and high parental attachment groups were smaller in magnitude for the low friends' use groups than they were for the high friends' use groups. This difference indicates that the moderating effect associated with higher levels of parental attachment appears to be slightly stronger for participants who reported high levels of friends' use than for those who reported low levels of friends' use. Overall, high parental attachment did moderate the relationship between friends' use and Hispanic adolescent PD abuse, with stronger moderation occurring with students who reported a greater amount of friends' use. These findings are consistent with results from the AMC use models. While these results are statistically significant, it is important to note that the large sample size, relatively low amount of PD abuse within the sample, and relatively small differences in the mean scores between low and high groups indicate that the moderation associated with parental attachment is relatively small.

The plot of the interaction between friends' use and parental injunctive norms (see Figure 6) indicates that individuals with high levels of reported friends' use and low levels of parental injunctive norms had a higher estimated mean PD abuse than students with high levels of reported friends' use and high parental injunctive norms. The same pattern was present with low levels of reported friends' use and low and high levels of parental injunctive norms, although the differences between the low and high parental injunctive norms groups were smaller in magnitude for the low friends' use groups than

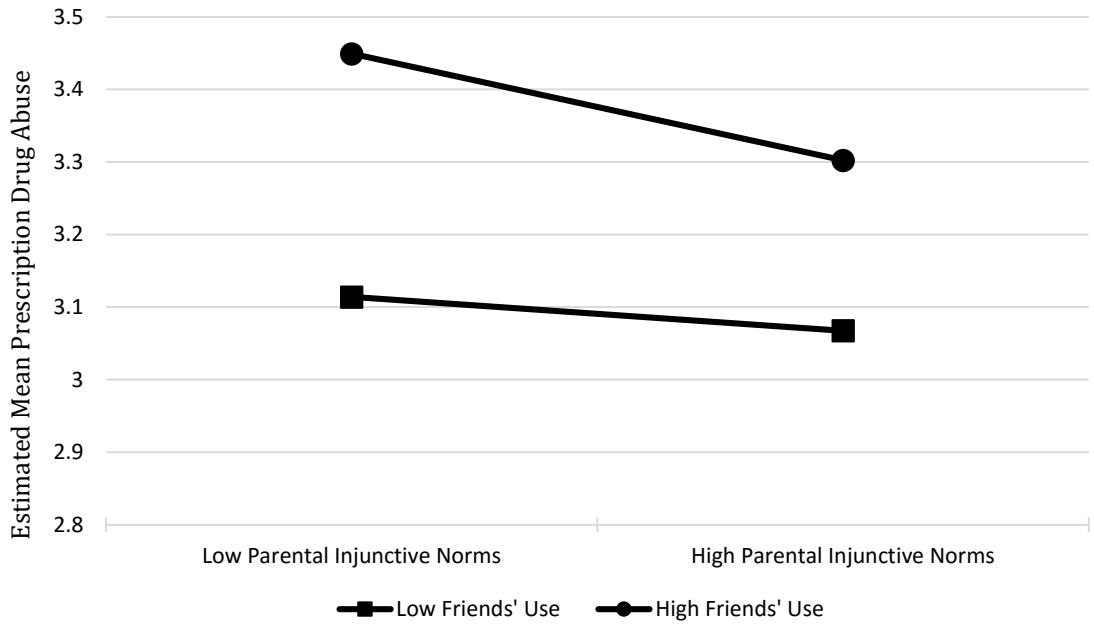

Figure 6. Plot of the Parental Injunctive Norms Moderator With PD Abuse as the Dependent Variable.

they were for the high friends' use groups. This difference is consistent with results from the AMC use models, and indicates that the moderating effect associated with higher levels of parental injunctive norms appears to be stronger for participants who reported high levels of friends' use than for those who reported low levels of friends' use. Overall, high parental injunctive norms moderated the relationship between friends' use and Hispanic adolescent AMC use, with more pronounced moderation occurring with students who reported a greater amount of friends' use.

As was done with AMC use, a second PD abuse model was also conducted in large part to explore possible differences between grade levels. This second PD abuse model included predictor variables that were statistically significant from the initial model as well as the following: two-way interactions between the friends' use variable

and statistically significant parent and community variables, and three-way interactions between the friends' use variable, statistically significant parent and community variables, and grade level. Results from the second PD abuse model can be found in Table 9.

The second PD abuse model's exponentiated intercept, which was 4.356, represents the estimated reported PD abuse when all other predictors are zero (Coxe et al., 2009). Results indicate that the friends' use and parental injunctive norms regarding PD abuse predictor variables were both statistically significant at the ≤.001 level. The

Table 9

AYS PROC GLIMMIX Procedure Results With Statistically Significant Variables, Friends' Use Interactions, Grade-Level Interactions, and With Adolescent PD Abuse as the Dependent Variable.

Variables	Regression Coefficient	Standard Error of Regression Coefficient	Exponentiated Regression Coefficient	p
Intercept	1.472	0.050	4.356	**≤.001****
Grade	-0.003	0.003	0.997	0.408
Friends' Use	0.031	0.008	1.032	**≤.001****
Parental Attachment	-0.003	0.001	0.997	0.006*
Parental Injunctive Norms Regarding Prescription Abuse	-0.058	0.008	0.943	**≤.001****
Friends' Use X Parental Attachment	0.001	0.001	1.001	0.501
Friends' Use X Parental Injunctive Norms Regarding Prescription Abuse	-0.007	0.002	0.993	**≤.001****
Friends' Use X Parental Attachment X Grade	-0.0002	0.0001	0.9999	0.241
Friends' Use X Parental Injunctive Norms Regarding Prescription Abuse X Grade	0.0003	0.0001	1.0003	0.033*

*Significant at the ≤.05 level; ****Significant at the ≤.001 level**

parental attachment variable was significant at the ≤.05 level. The two-way interaction between friends' use and parental injunctive norms regarding PD abuse was statistically the ≤.05 level. The parental attachment three-way interaction was not statistically significant at the ≤.05 level. The three-way interaction between friends' use, parental injunctive norms regarding PD abuse, and grade level was also statistically significant at significant.

The friends' use exponentiated coefficient was 1.032, which was associated with an increase in the predicted PD abuse from 4.356 to 4.495. Thus, a 1-unit increase in the friends' use predictor variable above mean friends' use was associated with a predicted mean PD abuse increase of 0.139. The parental attachment exponentiated coefficient of 0.997 indicates that, with all other variables in the model held at zero, an increase of 1-unit on the parental attachment scale above the grand mean was associated with a decrease in predicted PD abuse from 4.356 to 4.343. Consequently, a 1-unit increase in the parental attachment predictor variable above the grand mean was associated with a predicted mean PD abuse decrease of 0.013. The parental injunctive norms regarding PD abuse exponentiated coefficient of 0.943 was associated with a decrease in predicted PD abuse from 4.356 to 4.108. Consequently, a 1-unit increase in the parental injunctive norms predictor variable above the grand mean was associated with a predicted mean PD abuse decrease of 0.248. The community injunctive norms exponentiated coefficient of 1.014 was associated with an increase in predicted PD abuse from 6.273 to 6.361. Consequently, a 1-unit increase in the community injunctive norms predictor variable above the grand mean was associated with a predicted mean PD abuse increase of 0.088. The plot of the interaction between friends' use and parental injunctive norms regarding

PD abuse (see Figure 7) produced results that were similar to the parental injunctive norms interaction in the first PD abuse model (as shown in Figure 6). Results indicate that individuals with high levels of reported friends' use and low levels of parental injunctive norms regarding PD abuse had a higher estimated mean PD abuse than students with high levels of reported friends' use and high parental injunctive norms regarding PD abuse. The same pattern was present with low levels of reported friends' use and low and high levels of parental injunctive norms, although the differences between the low and high parental injunctive norms groups were smaller in magnitude for the low friends' use groups than they were for the high friends' use groups. Overall, high parental injunctive norms regarding PD abuse moderated the relationship between

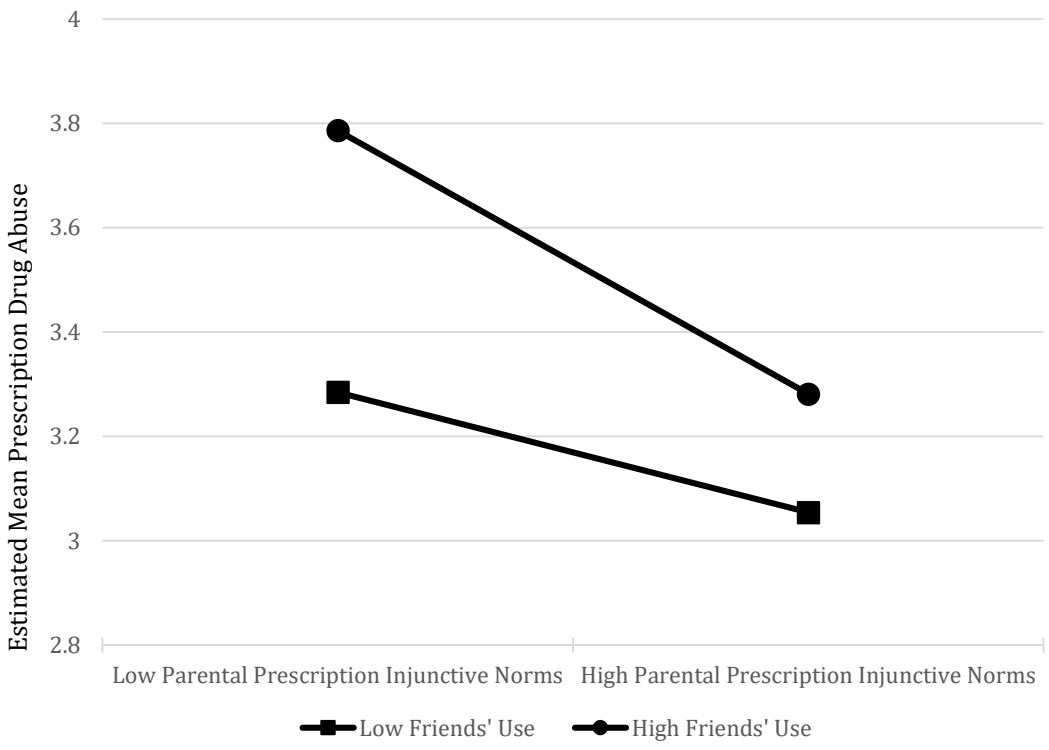

Figure 7. Plot of the Parental Injunctive Norms Regarding PD Abuse Moderator With PD Abuse as the Dependent Variable.

friends' use and Hispanic adolescent AMC use, with more pronounced moderation occurring with students who reported a greater amount of friends' use.

The resulting plots of the interaction between friends' use, parental injunctive norms regarding PD abuse, and grade level (Figure 8) indicate that individuals across grade levels with high levels of reported friends' use and low levels of parental injunctive norms had a higher estimated mean PD abuse than students with high levels of reported friends' use and high parental injunctive norms. This pattern was also present with low levels of reported friends' use and low and high levels of parental injunctive norms, although the differences between the low and high parental injunctive norms groups were smaller in magnitude for the low friends' use groups than they were for the high friends' use groups. This difference indicates that the moderating effect associated with higher levels of parental injunctive norms appears to be somewhat stronger for participants who reported high levels of friends' use than for those who reported low levels of friends' use. Plots also indicate that 10th-graders who reported high levels of friends' use demonstrated a somewhat greater difference between the low and high parental injunctive norms groups than 8th-graders, while 12th-graders had somewhat greater difference than 10th -graders. This result indicates that the protective effect associated with parental injunctive norms appears to increase slightly for Hispanic adolescents in higher grades. Overall, results from the second PD abuse model indicate that high parental injunctive norms continued to moderate the relationship between friends' use and Hispanic adolescent AMC use, with stronger moderation occurring for older adolescents.

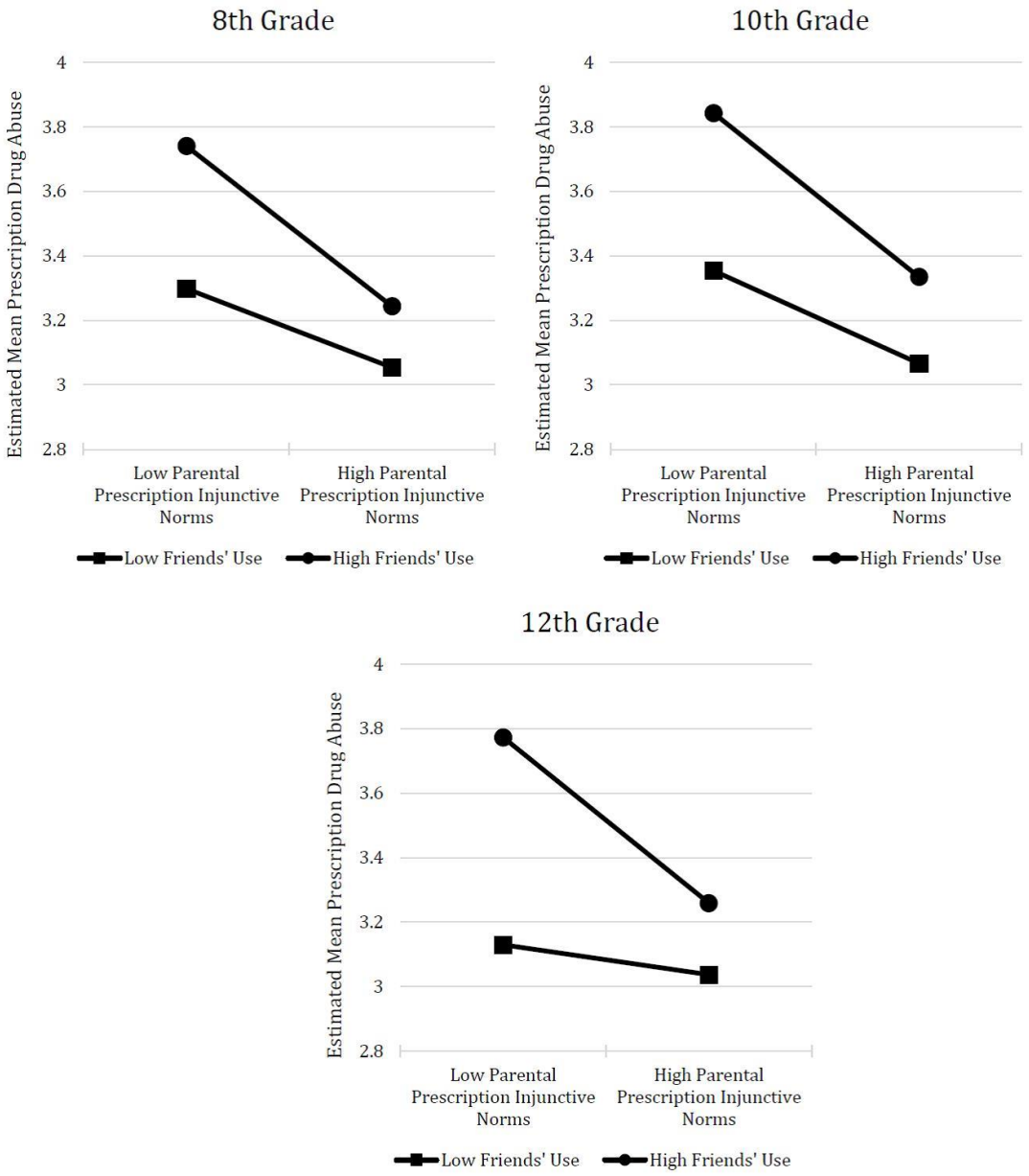

Figure 8. Plots of the Friends' Use, Parental Injunctive Norms Regarding PD Abuse, and Grade Level 3-way Interaction With PD Abuse as the Dependent Variable.

CHAPTER IV

DISCUSSION

Major Findings

The main goal of this study was to investigate the relationship between Hispanic adolescent drug use, friends' drug use, and parental and community protective factors. Much of the research in the area of adolescent substance use risk and protective factors lacks diverse samples and is often based upon the assumption that the factors being analyzed are universally valid across diverse populations (Bersamin et al., 2005; Botvin et al., 2001; Chen et al., 2012 et al.; Szapocznik et al., 2007; Wallace & Muroff, 2002). Given the continued growth of the Hispanic population as well as a lack of research analyzing specific risk and protective factors associated with Hispanic adolescent substance use, this study sought to improve academic understanding in these areas as well as inform prevention and intervention efforts with Hispanic adolescents.

The initial research questions sought to better understand the relationship between predictor variables and adolescent use of marijuana, alcohol, cigarettes, and prescription drugs within the previous 30 days. Initial analysis of the data, however, indicated that prescription drug abuse occurred at a much lower rate than the other three substances and conceptually appeared to be better suited for separate analyses. Due to these concerns, separate analyses were conducted for both AMC use and PD abuse. Two models were

analyzed for AMC use and two models for PD abuse. The initial models included all of the predictor variables as well as interactions between friends' use and community and parental predictor variables. The second models included all variables that were statistically significant in the first models, two-way interactions between friends' use and statistically significant parental and community variables, and three-way interactions between friends' use, parental and community variables, and grade level. Results from all four analyses were used to answer both of the primary research questions.

The first research question asked whether or not higher levels of parental attachment and parental injunctive norms regarding adolescent substance use would moderate the relationship between Hispanic adolescent substance use and involvement with drug-using friends. The second question asked whether or not higher levels of community attachment and community injunctive norms regarding adolescent substance use would moderate the relationship between Hispanic adolescent substance use and involvement with drug using friends. Secondary research questions sought to determine if significant differences would arise based upon grade, gender, socioeconomic status, and level of acculturation. This section will discuss results as they relate to the research questions as well as additional findings.

Research Question One

The first research question asked whether or not higher levels of parental attachment and parental injunctive norms regarding adolescent substance use would moderate the relationship between Hispanic adolescent substance use and involvement with drug-using friends. Friends' drug use exponentiated coefficients were statistically

significant across all AMC use and PD abuse analyses, indicating that increases in reported friends' drug use were associated with increases in self-reported Hispanic adolescent drug use. These results are consistent with prior research that has clearly shown that peer drug use is associated with increased risk of adolescent substance use (Cleveland et al., 2008; Ennett et al. 2006; Galea et al., 2004; Olds & Thombs, 2001; Steinberg et al., 1994; Windle, 2000). The parental attachment variable also produced statistically significant results in AMC use and PD abuse analyses, although results were not as robust. The parental injunctive norms variable produced significant results in the AMC use models, but not in the PD abuse models; however, the parental injunctive norms regarding PD abuse variable produced significant results in both PD abuse models. Results from each of these variables, their interactions with friends' use, and implications as they relate to the first research question will be discussed in greater detail below.

Results from both AMC use analyses produced statistically significant results for the parental attachment variable. Results indicated that higher levels of parental attachment were associated with decreases in Hispanic adolescent AMC use; however, the changes in AMC use associated with parental attachment were consistently smaller than those associated with all other statistically significant predictor variables in the AMC use models, indicating that higher levels of parental attachment were associated with relatively small reductions in AMC use. Results from both AMC use analyses also produced statistically significant interactions between parental attachment and friends' use. In order to clarify interpretation of these interactions, the least squared means of high and low level parental attachment and friend's use groups were plotted. Plot results indicated that both low and high friends' use groups reported lower levels of AMC use

with high levels of parental attachment than with low levels of parental attachment. Participants who reported high levels of friends' use experienced a greater decrease in AMC use associated with high levels of parental attachment than those who reported low levels of friends' use. These results indicate that higher levels of parental attachment were associated with a moderation in the relationship between friends' use and Hispanic adolescent AMC use. The second AMC use model included three-way interactions between friends' use, grade level, parental, and community variables. Results indicated that the three-way interaction between parental attachment, friends' use, and grade level was not statistically significant, although it did approach statistical significance at the .05 level.

Results from PD abuse analyses indicate that higher levels of parental attachment were also associated with decreases in Hispanic adolescent PD abuse, although the changes in PD abuse that were associated with parental attachment were once again relatively small when compared to other statistically significant variables. Results from the first PD abuse analysis produced statistically significant interactions between parental attachment and friends' use, while the same interaction in the second analysis approached statistical significance. Plot results indicated that both low and high friends' use groups reported lower mean levels of PD abuse with high levels of parental attachment than with low levels of parental attachment. Participants who reported high levels of friends' use experienced a greater decrease in PD abuse associated with high levels of parental attachment than those who reported low levels of friends' use, indicating that higher levels of parental attachment were associated with a moderation in the relationship between friends' use and Hispanic adolescent PD abuse. It is important to note, however,

that PD abuse mean changes were somewhat small compared to the scale of the PD abuse variable, which may be due to relatively small moderation, but also could be due in part to low levels of reported PD abuse by respondents. The second PD abuse model included three-way interactions between friends' use, grade level, parental, and community variables. Results indicated that the three-way interaction between parental attachment, friends' use, and grade level was not statistically significant, indicating that no significant differences in these relationships were found between grade levels.

Results from AMC use analyses indicate that higher levels of parental injunctive norms were associated with decreases in Hispanic adolescent AMC use. The changes in AMC use associated with the parental injunctive norms variable were the second largest within the AMC use models, with friends' use being the only other variable that was associated with a larger change in AMC use. Results from both AMC use analyses also produced statistically significant interactions between parental injunctive norms and friends' use. The resulting plots indicated that both low and high friends' use groups reported lower levels of AMC use with high levels of parental injunctive norms than those with low levels of parental injunctive norms. In addition, participants who reported high levels of friends' use experienced a greater decrease in AMC use associated with high levels of parental injunctive norms than those who reported low levels of friends' use. These results indicate that higher levels of parental injunctive norms were associated with a moderation in the relationship between friends' use and Hispanic adolescent AMC use. Put more simply, those Hispanic adolescents who reported higher levels of parental disapproval of adolescent substance use on average had lower levels of reported AMC use than those who reported lower levels of parental disapproval of

adolescent substance use. This relationship was more pronounced for adolescents who reported higher levels of friends' use than for adolescents who reported lower levels of friends' use. The three-way interaction between friends' use, grade level, and parental injunctive norms was statistically significant. Plots of this three-way interaction indicate that 10th- and 12th-graders who reported high levels of friends' use experienced a slightly greater difference between the low and high parental injunctive norms groups than 8th graders. This result indicates that the moderating effect associated with parental injunctive norms appears to be somewhat stronger for 10th- and 12th-grade Hispanic adolescents than it is for 8th-grade Hispanic adolescents.

The results from the first PD abuse model did not produce statistically significant results for the parental injunctive norms variable, indicating that higher levels of parental injunctive norms were not associated with decreases in Hispanic adolescent AMC use. The analysis, however, did produce a statistically significant interaction between parental injunctive norms and friends' use. The resulting plot indicated that both low and high friends' use groups reported lower levels of PD abuse with high levels of parental injunctive norms than those with low levels of parental injunctive norms. In addition, participants who reported high levels of friends' use experienced a greater decrease in PD abuse associated with high levels of parental injunctive norms than those who reported low levels of friends' use. As was the case with other variables, this relationship was more pronounced for adolescents who reported higher levels of friends' use than for adolescents who reported lower levels of friends' use.

Differences between the statistical significance of parental injunctive norms in the AMC use and PD abuse models may be attributable in part to the fact that the parental

injunctive norms variable used in these analyses contains adolescent ratings of parental disapproval of AMC use, but does not list prescription drugs as one of the types of drugs that parents disapprove of. Another possible explanation for the difference could be that adolescent perceptions of PD abuse may be less negative due to a perception that medically prescribed drugs are less harmful than other drugs. In order to address possible limitations associated with the parental injunctive norms variable both of the PD abuse models included the parental injunctive norms regarding PD abuse variable, which was not included in the AMC use models. Within the two PD abuse models the parental injunctive norms regarding PD abuse variable produced regression coefficients that were statistically significant. The resulting exponentiated coefficients indicated that higher levels of reported parental injunctive norms regarding PD abuse were associated with decreased reported PD abuse, and were associated with a larger change in PD abuse than any other predictor variable in the analyses, including the friends' use variable. Results from the first PD abuse analysis did not result in a statistically significant interaction between parental injunctive norms regarding PD abuse and friends' use; however, a statistically significant interaction was found in the second PD abuse analysis. The resulting plot of the interaction indicated that both low and high friends' use groups reported lower levels of PD abuse with high levels of parental injunctive norms regarding PD abuse than those with low levels of parental injunctive norms regarding PD abuse. Within the second PD abuse analysis, the three-way interaction between friends' use, parental injunctive norms regarding prescription abuse, and grade level was statistically significant. The plots of the three-way interaction indicate that parental injunctive norms moderated the relationship between friends' use and PD abuse, and that this moderation

was slightly larger for each successive increase in grade level. These results indicate that higher levels of parental injunctive norms regarding PD abuse were associated with slightly greater moderation for older adolescents, and that this increase appeared to steadily increase across age groups.

Overall, results from the four analytical models indicate that higher levels of parental attachment do moderate the relationship between Hispanic adolescent substance use and friends' use, although the change associated with higher levels of parental injunctive norms appears to be relatively small compared to the change associated with higher levels of friends' use. Results from AMC use models indicate that higher levels of parental injunctive norms also were associated with moderating the relationship between Hispanic adolescent AMC use and friends' use, whereas PD abuse models indicated that higher levels of parental injunctive norms regarding PD abuse were found to moderate the relationship between Hispanic adolescent PD abuse and friends' use. Taken together, these results indicate that parental injunctive norms are associated with decreased likelihood of Hispanic adolescent substance use, and also appear to mitigate some of the increased risk of substance use associated with higher levels of friends' use. One important finding was that decreases in predicted substance use associated with higher levels of parental injunctive norms were consistently larger than those associated with higher levels of parental attachment. Another important finding was that those respondents who reported high levels of friends' use appeared to benefit the most from both higher levels of parental attachment and higher levels of parental injunctive norms than students who reported low levels of friends' use.

Research Question Two

The second research question asked whether or not higher levels of community attachment and community injunctive norms regarding adolescent substance use would moderate the relationship between Hispanic adolescent substance use and involvement with drug-using friends. As was noted previously, results from all four analyses clearly indicate that friends' drug use was associated with increases in self-reported Hispanic adolescent AMC use and PD abuse. The community attachment variable failed to produce statistically significant results in the initial AMC use and PD abuse analyses, and consequently was not included in the second analytical models for AMC use and PD abuse. The community injunctive norms variable did produce significant results in both of the AMC use models, but not in the PD abuse models. Results from each of these variables, their interactions with friends' use, and implications as they relate to the second research question will be discussed in greater detail below.

Results from both AMC use analyses produced statistically significant results for the community injunctive norms variable. Results indicated that higher levels of community injunctive norms were associated with increases in Hispanic adolescent AMC use. This result was somewhat surprising and on the surface seems counterintuitive; however, these results may be attributable to a number of different factors. First, when examining the items that were used to develop the community injunctive norms construct, one might note that a specific subset of the community was represented in this variable. The variable consisted of three items that asked adolescents to rate their perception of the level of their adult neighbors' disapproval if the respondent were to use a particular drug. More specifically, the three questions used in this scale ask: "How

wrong would most adults in your neighborhood think it was for kids your age to…" with the three drugs (marijuana, alcohol, and cigarettes). The possible responses for this question were: very wrong, wrong, a little bit wrong, and not wrong at all. One may question whether or not a large portion of the respondents had minimal contact with adults in their neighborhood, or may have had negative associations, relationships, or experiences with adults in their neighborhood. Given that the friends' use variable utilizes the respondent's four best friends' use as a measure of friends' use, and the parental variables utilize perceptions of parental attitudes and relationships, one might argue that it is not surprising that a variable that measures the perceptions of "most adults in your neighborhood" would produce different results due to the typical lack of closeness in the relationship between respondents and this group compared to the parental and friends groups. The community attachment variable did not produce statistically significant results, which may also be an indication that adult neighbors as a whole did not maintain close relationships with respondents, and may in fact be perceived negatively by respondents, and/or respondents may have had negative interactions with adults in their neighborhood due to drug use. Finally, "most of the adults in your neighborhood" is a relatively broad category that may be interpreted very differently by respondents, which may have produced results that may reflect negative interactions with adult authority figures such as school staff, law enforcement, or other adult figures that may have specific roles that prompt negative interactions with adolescents who may be using substances. This explanation seems to fit with the supposition made by some researchers that minority adolescents are more likely to have weaker social bonds to conventional social institutions, such as schools or local community organizations, than

those of White adolescents (Chen et al., 2012). Overall, additional information regarding which adult community members outside of family members may influence Hispanic adolescent substance use is needed. Future research may benefit from additional sources and methods to better define and measure community attachment and community injunctive norms among Hispanic youth.

Results from both AMC use analyses produced statistically significant interactions between community injunctive norms and friends' use. Plot results indicated that both low and high friends' use groups reported higher levels of AMC use with high levels of community injunctive norms than with low levels of community injunctive norms. Participants who reported high levels of friends' use experienced a greater increase in AMC use associated with high levels of community injunctive norms than those who reported low levels of friends' use. These results indicate that higher levels of community injunctive norms were associated with an increase in the strength of the relationship between friends' use and Hispanic adolescent AMC use. Again, these results are rather surprising and indicate that respondents responded negatively to the perception of adult neighbors' disapproval of respondents' use of drugs. The second AMC use model's three-way interaction between community injunctive norms, friends' use, and grade level was not statistically significant, indicating that significant differences between grade levels were not found.

Overall, results from the four analytical models indicate that community attachment, as measured within this study, was not significantly associated with Hispanic adolescent AMC use of PD abuse. Surprisingly, higher levels of community injunctive norms, as measured within this study, were associated with increases in reported AMC

use. Community injunctive norms also were not significantly associated with PD abuse. Generally speaking, the results from all four analyses indicate that parental and peer factors as measured within this study appear to be more closely associated with Hispanic adolescent substance use than community factors.

Additional Findings

As was noted previously, it was predicted that significant differences would be found based upon grade, gender, socioeconomic status, and level of acculturation. The grade, gender, and level of home language variables all produced significant results in the AMC use models, whereas parent education level did not produce significant results in any of the models, which is not consistent with result from some previous research (Wills, McNamara, & Vaccaro, 1995). This lack of significance may be due in part to faults in the parent education level measure given that it is a one-item measure that is based upon information that a segment of adolescents may not have had access to prior to completing the AYS. Despite these concerns, based upon results from the analyses, parent education level, as measured by the AYS, was not significantly associated with Hispanic adolescent AMC use or PD abuse. The grade, gender, and level of home language variables failed to produce significant results in the PD abuse models, indicating that these factors, as they were measured in this study, were not significantly associated with reported Hispanic adolescent PD abuse.

Regression coefficients for gender were significant in the AMC use models, but were not significant in the PD abuse models. Results indicate that female Hispanic adolescents on average were less likely to report AMC use than their male counterparts.

These findings are consistent with prior research findings (Griffin et al., 2000; Saint-Jean, 2008) and are consistent with predictions that were made prior to the analyses. While one may hypothesize that this gender difference could be attributable in part to Hispanic family gender roles and cultural norms, one must also take into consideration that gender differences have also been found within other populations (Steinberg & Monahan, 2007). To better understand possible differences between ethnic and/or racial groups, additional research with a diverse sample would likely provide greater opportunity to directly compare groups. Overall, female Hispanic adolescents experienced lower levels of risk associated with Hispanic adolescent AMC use when compared to males, but no significant difference was found with PD abuse.

Grade level was also a variable that was included in the analyses. Overall, it was predicted that reported Hispanic adolescent drug use would increase in older grades. The grade level factor consisted of 8^{th}-, 10^{th}-, and 12^{th}-grades with 8^{th}-grade being used as the comparison group. Results from AMC use models produced statistically significant grade level regression coefficients, while results from the PD abuse models did not produce significant results. Results indicate that being in an older grade (e.g., 10^{th}- vs. 8^{th}-grade) was associated with an increase in reported AMC use. This increased risk associated with older Hispanic adolescents is consistent with prior research findings (Johnston et al., 2014; Steinberg & Monahan, 2007). Results from the analyses also indicate that respondents in higher grades who reported high levels of friends' use demonstrated a somewhat greater difference between the low and high parental injunctive norms groups than those in lower grades. These results were found in both the AMC use and PD abuse models. This result indicates that the moderation in the relationship

between Hispanic adolescent substance use and friends' use associated with parental injunctive norms appears to increase slightly for Hispanic adolescents in higher grades.

The predominant language spoken at home was the variable used to measure level of acculturation. While predominant language spoken at home is a single item variable that does not fully measure the construct of acculturation level, researchers have found it to be an adequate general measure of this construct (Saint-Jean et al., 2007). Regression coefficients for home language were significant in the AMC use models, but were not significant in the PD abuse models. Results indicate that predominant use of Spanish was associated with decreased AMC use. These findings are consistent with prior research findings (Kam & Cleveland, 2011; Saint-Jean et al., 2007; Saint-Jean, 2008; Szapocznik et al., 2007) and are consistent with predictions that were made prior to the analyses that predicted decreased risk associated with lower levels of acculturation to predominant U.S. cultural norms. This finding adds to the growing body of research that have linked higher levels of traditional Hispanic cultural norms with reduced risk of Hispanic adolescent substance use; however, PD abuse models did not produce statistically significant results for the home language variable. Significant results may be due in part to general Hispanic cultural expectations that emphasize following parental expectations and behaving in a way that protects the family reputation within the community (Parsai et al., 2008).

Model Comparisons

Overall, differences as well as similarities in results were noted between initial models and second models as well as between models that utilized AMC use as the

dependent variable and models that utilized PD abuse as the outcome variable. While research questions regarding differences in the relationships between the predictor variables and dependent variables of AMC use and PD abuse were not included in the original research proposal, notable differences in the relationships that were found between the two outcome variables may provide useful insight, particularly in the area of PD abuse. One result that was consistent across both PD abuse and AMC use was that parental education level was not statistically significant in any of the models. In addition, results from all of the models for both AMC use and PD abuse indicate that friends' drug use was consistently associated with increased Hispanic adolescent AMC use and PD abuse.

One interesting finding was the difference found between AMC use and PD abuse associations with parental injunctive norms. Although this variable was significant in AMC use models, it was not statistically significant in PD abuse models. As was noted earlier, this finding may be due in part to the fact that alcohol, marijuana, and tobacco were the drugs that were used to rate parental disapproval, while prescription drugs were not included in this survey item. This result may be attributable in part to the relatively benign view some parents and/or adolescents may have of prescription drugs or perhaps a lack of direct communication of disapproval of substance use in general, and PD abuse, specifically, by some Hispanic parents (Ford, 2008; Szapocznik et al., 2007). This second explanation may be more likely given the differences that were noted between the parental injunctive norms variable and the parental injunctive norms regarding PD abuse variable. One important difference was the lower mean rating of disapproval, even after accounting for fewer items, found for the parental injunctive norms PD abuse variable.

This may indicate that respondents' parents, on average, communicated less disapproval of PD abuse, or perhaps did not address abuse of these substances altogether. Additional research that includes multiple ethnic and racial groups would be beneficial to determine if these findings are unique to Hispanic families.

Another difference between PD abuse models and AMC use models was the number of variables that were found to be statistically significant. Overall, PD abuse models produced fewer regression coefficients that were statistically significant than the AMC use models. In addition, those variables that were statistically significant were associated with smaller predicted changes in Hispanic adolescent PD abuse than were found in the AMC use models. Taken together, these results indicate that the risk and protective factors that are included in these models are generally more closely associated with AMC use than they are for PD abuse. This may be due in part to different processes associated with PD abuse as well as differing perceptions associated with PD abuse. One may also speculate that the relatively low rate of PD abuse compared to AMC use may contribute to these differences, or that PD abuse is more likely to occur when an adolescent has had greater substance use experience and perhaps greater likelihood for actual substance dependence. Additional research to better understand factors associated with PD abuse among adolescents is warranted, particularly using datasets that include diverse populations.

Limitations

While this research study utilized samples and methodologies that are likely to produce valid results, some limitations should be taken into consideration when

interpreting results. One of the main limitations of this study is the cross-sectional design, which can limit the conclusions that can be drawn. While self-reported survey data have been shown to be a reliable measure of adolescent drug use and other delinquent behaviors (Cleveland et al., 2008), greater information regarding possible causal relationships would be accessible using additional longitudinal research. Another limitation of this study is that the factors that were examined in the study were based solely upon the self-reported perceptions of the adolescent participants, which may not fully reflect the factors that are found within their communities and families due to the fact that participants' perceptions may not fully or accurately reflect actual constructs such as parental injunctive norms or community injunctive norms. It is important to note, however, that research has demonstrated that adolescent perceptions of factors such as peer substance use are clearly associated with increased risk of use, which supports the underlying importance of understanding how adolescent perceptions of factors such as parental injunctive norms is associated with adolescent substance use (Ennett & Bauman, 1994). The limited numbers of items on the AYS as well as the self-reported nature of the AYS items used to construct the variables used in this study are also limitations that should be taken into consideration when interpreting results.

Another limitation of this study was the relatively limited geographic location of the participants. Although Hispanic populations are sometimes perceived as a homogenous group given language similarities, cultural and historical differences and heterogeneity can be found within Hispanic populations (Saint-Jean, 2008; Szapocznik et al., 2007). Given that all respondents were students in Arizona schools, generalizing results to other Hispanic populations in other geographic regions should be done with

some caution, given the diversity found within Hispanic populations. For example, Hispanic populations in Arizona are predominantly of Mexican origins, while eastern states such as Florida or New York have a greater number of Hispanics with origins from countries such as Cuba or Puerto Rico. Despite these concerns, results from this study are likely to be an accurate representation of Hispanic adolescents within the state of Arizona as well as Hispanic adolescents within the southwest region of the United States.

Whereas AMC use and PD abuse were used to look at the broader construct of recent substance use, there are possible differences between factors associated with use of each of the substances included in these dependent variables. For example, a number of differences were noted between PD abuse and AMC use. These differences indicate that associations between drug use and risk and protective factors vary between AMC use and PD abuse. Likewise, the grouping of alcohol, marijuana, and cigarette use, although an important gauge of general levels of adolescent substance use, may have masked some of the possible differences between the uses of each of these substances. Although this is a limitation of this study, many other research studies have combined the use of multiple substances into one construct to analyze general substance use, which is an important construct to understand given that a majority of adolescent substance users are likely to have used more than one drug (Duan et al., 2008).

Future Research

The Hispanic population included in this study was intentionally selected to increase current understanding of factors associated with Hispanic adolescent substance use. While the use of a Hispanic sample contributes to a greater understanding of

variables associated with Hispanic adolescent substance use, an inclusion of comparable samples of Caucasian and other racial or ethnic groups will produce opportunities for direct comparisons between groups. Future research utilizing racial and/or ethnically diverse samples will likely provide greater opportunity to make direct comparisons of differential effects associated with risks and protective factors. For example, analyses that compare results across ethnic and racial groups could be used to provide additional information as to whether or not the need for specificity of injunctive norms related to PD abuse is relatively unique to a Hispanic population or if it is consistent across diverse groups. In addition, the sample that was used in this study was taken solely from the state of Arizona, which may limit the generalization of results to that region of the country given the diversity of backgrounds and cultural differences that can be found within Hispanic populations across the United States. Utilizing a more geographically diverse sample may also increase generalization of results.

As was noted earlier, future research may also benefit from longitudinal methods to improve the ability of researchers to more effectively examine relationships between variables. Future use of objective measures from multiple sources, such as peer or parental report, would also strengthen the variable constructs that were examined in this study. Expanding measurement to include parental perspectives may also provide particular insight into parental variables such as parental attachment and parental injunctive norms.

Results from this study included analyses of moderating effects associated with Hispanic adolescent drug use and friends' use. Whereas factors such as parental attachment, parental injunctive norms, and community injunctive norms were found to be

statistically significant moderators of the relationship between friends' use and Hispanic adolescent AMC use and PD abuse, additional research that analyzes other factors that may mitigate the negative effects associated with friends' substance use will likely be beneficial. Given that a wide array of research studies have found a strong relationship between peer substance use and substance use among adolescents, future research should include a broader number of moderation factors based upon sound theoretical constructs and prior research findings. Increasing our understanding of those factors that may mitigate the relationship between peer and adolescent substance use will likely improve prevention and intervention efforts.

While alcohol, marijuana, and tobacco are the drugs with the highest adolescent use rates, analyses that examine each substance separately could provide additional information that is more specific to use of each of these substances. Based upon the results from this study, future research that examines the relationships between risk and protective factors and specific drug use may be beneficial given the significant differences found between AMC use and PD abuse analyses. One particularly notable finding in this study was the significant effect of parental injunctive norms regarding PD abuse and Hispanic adolescent PD abuse. The specificity found within the parental injunctive norm PD abuse variable appears to have contributed to a greater protective effect than the effect associated with the general parent injunctive norm variable. Future research examining differences in communicating parental injunctive norms across different substances will likely improve our understanding of parental injunctive norms and may better inform prevention efforts. In general, regression coefficients in PD abuse models were associated with smaller changes in PD abuse than the changes that were

associated with AMC use in AMC use models, indicating that PD abuse may be influenced by a different set of risk and protective factors. Given the relatively small number of research studies that have examined risk and protective factors associated with PD abuse among adolescents, particularly within minority populations, future research examining factors associated PD abuse within diverse populations is needed (Ford, 2008; Schepis, & Krishnan-Sarin, 2008; Young et al., 2012).

Conclusion

This study investigated the relationship between Hispanic adolescent AMC use and PD abuse, friends' drug use, parental attachment, parental injunctive norms, community attachment, community injunctive norms, as well as gender, socioeconomic status, and level of acculturation. Survey data from the 2012 AYS collected from multiple Arizona schools were analyzed to better understand the relationship between the aforementioned variables. GLMM analyses were conducted to better understand the relationship between these variables and Hispanic adolescent drug use. Two models were conducted utilizing AMC use as the dependent variable, and two separate models were also conducted utilizing PD abuse as the dependent variable. Results from all four analytical models indicated that nesting within schools was not associated with significant differences in reported Hispanic adolescent drug use.

Overall, results from the four analytical models indicate that community attachment and parent education level, as measured within this study, were not significantly associated with Hispanic adolescent AMC use or PD abuse. Results from PD abuse and AMC use analyses indicate that higher levels of parental attachment were

associated with decreased Hispanic adolescent AMC use and PD abuse, although the change associated with higher levels of parental attachment were relatively small compared to those associated with other significant variables in the analyses, and particularly small when compared to the change associated with higher levels of friends' use. Results also indicate that higher levels of parental attachment moderated the relationship between Hispanic adolescent substance use and friends' use. Results from AMC use models indicate that higher levels of parental injunctive norms also were associated with moderating the relationship between Hispanic adolescent AMC use and friends' use. One important difference in this area was the lack of significance of the general parental injunctive norms variable in the PD abuse models; however, the parental injunctive norms regarding PD abuse variable was significant in the PD abuse models, indicating that Hispanic adolescent perceptions of parents' specific disapproval of PD abuse were associated with significant reductions in reported PD abuse. Higher levels of parental injunctive norms regarding PD abuse were also found to moderate the relationship between Hispanic adolescent PD abuse and friends' use. These results indicate that communicating specific parental disapproval of PD abuse could possibly be a more effective way to decrease the likelihood of PD abuse than communicating a general parental disapproval of drug use. Future research analyzing the effectiveness of differing approaches used to communicate parental injunctive norms regarding a variety of drugs may be beneficial. Overall, results indicate that parental injunctive norms are associated with decreased likelihood of Hispanic adolescent substance use, and also appear to moderate some of the increased risk of substance use associated with higher levels of friends' use.

Another important finding was that those respondents who reported high levels of friends' use appeared to benefit the most from higher levels of parental attachment and higher levels of parental injunctive norms than students who reported low levels of friends' use. While community injunctive norms were not significantly associated with PD abuse, they were significantly associated with AMC use; however, results unexpectedly indicated that higher levels of community injunctive norms, as measured within this study, were associated with predicted increases in reported AMC use rather than decreases. This relationship also appeared to be more pronounced for adolescents who reported high levels of friends' use. These results highlight the need for further research analyzing the relationship between community injunctive norms and Hispanic adolescent substance use. Results from all four analyses indicated that in general, parental and peer factors were associated with larger changes in Hispanic adolescent substance use than community factors.

Results for gender, home language, and grade level were significant in the AMC use models, but were not significant in the PD abuse models. Female Hispanic adolescents on average were less likely to report AMC use than their male counterparts. Results also indicated that students in higher grades, such as 10^{th}-versus 8^{th}-grade, reported higher levels of AMC use. Hispanic cultural norms, as measured by predominant language spoken at home, were associated with reduced risk of Hispanic adolescent AMC use.

While the findings from this research study are not conclusive, important implications for Hispanic adolescent drug use prevention and intervention efforts may be drawn. Given the strength of the relationship between Hispanic adolescent drug use and

friends' drug use, and the moderation associated with parental and community variables, prevention efforts that increase the understanding of Hispanic parents as well as school and community stakeholders about these relationships would likely be beneficial. In addition, given that the friends' drug use variable in this study was based upon relationships with each adolescent's four "best friends," prevention and intervention efforts may benefit from focusing efforts toward friendship groups rather than solely addressing individual drug use. Given the consistently significant results associated with parental injunctive norms, efforts to increase Hispanic parents' ability to effectively communicate disapproval of adolescent drug use are also warranted. In addition, emphasis should be placed on teaching parents to communicate specific disapproval of a wide range of substances that include prescription drugs along with other drugs. Varying results across AMC use and PD use also indicate that additional research that analyzes possible differences in the relationships between risk and protective factors across multiple drug categories, particularly within the Hispanic population, would be beneficial.

APPENDIX

AYS ITEMS FOR EACH VARIABLE

Demographic Variables		
Variable	Questions:	Possible responses:
Gender	Are you:	Female, Male
Grade	What grade are you in?	8, 10, 12
Hispanic	Are you Hispanic or Latino?	No, Yes
Level of acculturation	What is the language you use most often at home?	English, Spanish, Another language
Socioeconomic status	What is the highest level of education completed by your mother?	8th grade or less, Some high school, Completed high school or GED, Some college, Completed community college or technical school, Completed 4 year college (Bachelor's Degree), Graduate or Professional (e.g., Master's, Ph.D., M.D., Ed.D., J.D), Don't know

Adolescent Marijuana, Alcohol, and Cigarette Use Variable (AMC Use)	
How frequently have you smoked cigarettes during the past 30 days?	Not at all; Less than one cigarette per day; One to five cigarettes per day; About one-half pack per day; About one pack per day; About one and one-half packs per day; Two packs or more per day
On how many occasions (if any) have you had beer, wine or hard liquor during the past 30 days?	0 occasions, 1-2, 3-5, 6-9, 10-19, 20-39, 40 or more
On how many occasions (if any) have you used marijuana (grass, pot) or hashish (hash, hash oil) during the past 30 days?	0 occasions, 1-2, 3-5, 6-9, 10-19, 20-39, 40+ above

Adolescent Prescription Drug Abuse Variable (PD Abuse)	
On how many occasions (if any) have you used prescription sedatives (tranquilizers, such as Valium or Xanax, barbiturates, or sleeping pills) without a doctor telling you to take them during the past 30 days?	0 occasions, 1-2, 3-5, 6-9, 10-19, 20-39, 40 or more
On how many occasions (if any) have you used prescription stimulants (such as Ritalin, Adderall, or Dexedrine) without a doctor telling you to take them during the past 30 days?	0 occasions, 1-2, 3-5, 6-9, 10-19, 20-39, 40 or more
On how many occasions (if any) have you used narcotic prescription drugs (OxyContin, methadone, morphine, codeine, Demerol, Vicodin, Percocet) without a doctor telling you to take them, in the past 30 days	0 occasions, 1-2, 3-5, 6-9, 10-19, 20-39, 40 or more

Friends' Drug Use Variable	
Think of you <u>four best friends</u> (the friends you feel closest to). In the past year (12 months), how many of your best friends have:	
smoked cigarettes?	0, 1, 2, 3, 4
tried beer, wine or hard liquor (for example, vodka, whiskey or gin) regularly?	0, 1, 2, 3, 4
used marijuana?	0, 1, 2, 3, 4
used LSD, cocaine, amphetamines or another illegal drug?	0, 1, 2, 3, 4

Parental Attachment Variable	
Do you feel very close to your mother?	NO!, no, yes, YES!
Do you share your thoughts and feeling with your mother?	NO!, no, yes, YES!
Do you enjoy spending time with your mother?	NO!, no, yes, YES!
Do you share your thoughts and feeling with your father?	NO!, no, yes, YES!
Do you feel very close to your father?	NO!, no, yes, YES!
Do you enjoy spending time with your father?	NO!, no, yes, YES!

If I had a personal problem, I could ask my mom or dad for help.	NO!, no, yes, YES!

Parental Injunctive Norms Regarding Drug Use Variable	
How wrong do your parents feel it would be for YOU to:	
drink beer, wine, or hard liquor (for example, vodka, whiskey, or gin) regularly?	Very wrong, Wrong, A little bit wrong, Not wrong at all
smoke cigarettes?	Very wrong, Wrong, A little bit wrong, Not wrong at all
smoke marijuana?	Very wrong, Wrong, A little bit wrong, Not wrong at all

Parental Injunctive Norms Regarding Prescription Drug Abuse Variable	
How wrong do your parents feel it would be for YOU to:	
use prescription drugs without a doctor telling you to take them?	Very wrong, Wrong, A little bit wrong, Not wrong at all

Community Attachment Variable	
If I had to move, I would miss the neighborhood I now live in.	NO!, no, yes, YES!
I like my neighborhood.	NO!, no, yes, YES!
I'd like to get out of my neighborhood.	NO!, no, yes, YES!
My neighbors notice when I am doing a good job and let me know about it.	NO!, no, yes, YES!
There are people in my neighborhood who are proud of me when I do something well.	NO!, no, yes, YES!
There are people in my neighborhood who encourage me to do my best.	NO!, no, yes, YES!
There are lots of adults in my neighborhood I could talk to about something important	NO!, no, yes, YES!

Community Injunctive Norms Regarding Drug Use Variable	
How wrong would most adults in your neighborhood think it was for kids your age:	
to use marijuana.	Very Wrong, Wrong, A little bit wrong, Not wrong at all
to drink alcohol.	Very Wrong, Wrong, A little bit wrong, Not wrong at all
to smoke cigarettes.	Very Wrong, Wrong, A little bit wrong, Not wrong at all

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